GREAT LAKES FORESTRY CENTRE
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Results of forest insect and disease surveys in the NORTHEASTERN REGION of Ontario, 1987

CARRIED OUT BY THE GREAT LAKES FORESTRY CENTRE IN COOPERATION WITH THE ONTARIO MINISTRY OF NATURAL RESOUCES

D. C. Constable, W. A. Ingram, L.S. MacLeod and S. Melbourne

Miscellaneous Report No. 76

THE GREAT LAKES FORESTRY CENTRE

The Great Lakes Forestry Centre is one of six regional establishments located across Canada and operated by the Canadian Forestry Service. The overall objective of the Service is to promote the preservation, enhancement and wise use of a healthy, attractive and bountiful forest resource and terrestrial environment for the economic and social benefit of all Canadians. The Centre pursues this objective by conducting two major programs: research and technical services and forestry development. Both programs address major problems affecting forest management and the forest environment primarily in Ontario, but because of the transprovincial nature of the forest resource, many elements of our research program are of national significance.

The Centre specializes in research in forest production, forest protection, forest environment and forest utilization. These programs deal directly with the issue of maintaining and enhancing the resource supply. Activities range from basic to applied and developmental research, and include a significant technology transfer component.

Major activities in forestry development include federal management responsibility for federal-provincial forest management agreements, participation in the National Forestry Statistics program and forest economics research.

Close working relationships are maintained with the Ontario Ministry of Natural Resources, the forest industry, educational institutions specializing in forestry and the biological sciences, and other forestry organizations within the province. The Centre is represented on the Ontario Forestry Council and the Ontario Forestry Research Committee, which have responsibility for coordinating forestry research in Ontario.

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RESULTS OF FOREST INSECT AND DISEASE SURVEYS IN THE NORTHEASTERN REGION OF ONTARIO 1987

(FOREST DISTRICTS: WAWA, SAULT STE. MARIE, BLIND RIVER ESPANOLA, SUDBURY, TEMAGAMI AND NORTH BAY)

D.C. CONSTABLE, W.A. INGRAM, L.S. MACLEOD AND S. MELBOURNE

GREAT LAKES FORESTRY CENTRE

CANADIAN FORESTRY SERVICE

GOVERNMENT OF CANADA

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SURVEY HIGHLIGHTS

This report deals with the more important insect and disease problems in the Northeastern Region as determined from aerial and ground surveys.

The area of defoliation by the the forest tent caterpillar increased by approximately four times since 1986, the largest expansion occurring in North Bay and Temagami districts. The Bruce spanworm outbreak continued to increase in size after four consecutive years of infestation, and the insect has now defoliated approximately 202,000 ha of predominantly sugar maple forest across four districts of the region. In contrast, a collapse of both the spruce budworm and the jack pine budworm outbreaks occurred throughout the region. On the basis of egg-mass sampling for both these insects no infestations are forecast for 1988. Defoliation by the large aspen tortrix also ceased within the region and only small pockets (10 ha each) of damage were observed. Pheromone trapping for the gypsy moth revealed high numbers of males in Killarney Provincial Park, Sudbury District, and at South Bay Mouth, Espanola District. At one location in Espanola District, approximately 40 ha of red maple were moderately to severely defoliated by the green-striped mapleworm. The jack pine tip beetle infestation continued to increase at one location in Blind River District, and shoot damage amounted to 58%. The redheaded pine sawfly was much more commonly observed than in previous years.

Surveys for the European race of Scleroderris canker proved negative; however, the North American race was again detected in several plantations across the region. Western gall rust was observed at widely scattered locations in the region, and infection levels amounted to 52%.

Special surveys were conducted in 12 white spruce plantations to evaluate insect and disease problems. White spruce cones were collected to determine seed loss attributable to insects and diseases. Four Acid Rain National Early Warning System (ARNEWS) plots were revisited to detect early evidence of damage. As in previous years, surveys were conducted to sample either dead or dying trees for the presence of the pinewood nematode.

In this report, the following categories are used to describe the importance of insects or diseases:

Major Insects/Diseases

capable of causing serious injury to or death of living trees or shrubs

Minor Insects/Diseases

capable of causing sporadic or localized injury but not usually a serious threat to living trees or shrubs

Other Forest Insects/Diseases (Tables)

These tables provide information on two types of pest:

(1) those that are of minor importance and have not been known to cause serious damage to forest trees;

(2) those that are capable of causing serious damage but, because of low incidence or for other reasons, did not cause serious damage in 1987.

Districts affected by specific insects or diseases are listed beneath the names of those insects or diseases in the Table of Contents.

The authors would like to express their appreciation to personnel of the Ontario Ministry of Natural Resources (OMNR) and wood-using industries for their cooperation during the 1987 field season.

D.C. Constable
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S. Melbourne

Frontispiece

Forest tent caterpillar (*Malacosoma disstria* Hbn.)

Newly hatched larvae on an egg band

An inactive colony of larvae on trembling aspen

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INSECTS

Major Insects

Birch Sawfly, *Arge pectoralis* (Leach)

For the second consecutive year, moderate-to-severe defoliation was observed in Sudbury District. Complete defoliation occurred in a 15-ha stand of white birch *(Betula papyrifera* Marsh.) in McKim Township, and along Highway 17 in parts of Neelon and Dryden townships, 40 ha were completely defoliated.

Elsewhere in the region, no significant damage occurred.

Cedar Leafminers, *Argyresthia aureoargentella* Brower
Coleotechnites thujaella (Kft.)

Population levels of these cedar leafminers increased on Manitoulin Island in Espanola District. In 1986, 3,000 ha were reported to be damaged, but in 1987, approximately 10,000 ha of eastern white cedar-*(Thuja occidentalis* L.) sustained moderate-to-severe damage from Spring Bay in Campbell Township southeast to the Thomas Bay area of Wikwemikong Indian Reserve #26. Foliar damage varied from 50 to 100% in the above areas. Branch and whole-tree mortality was again noted in areas in which infestations have persisted over the past four to five years.

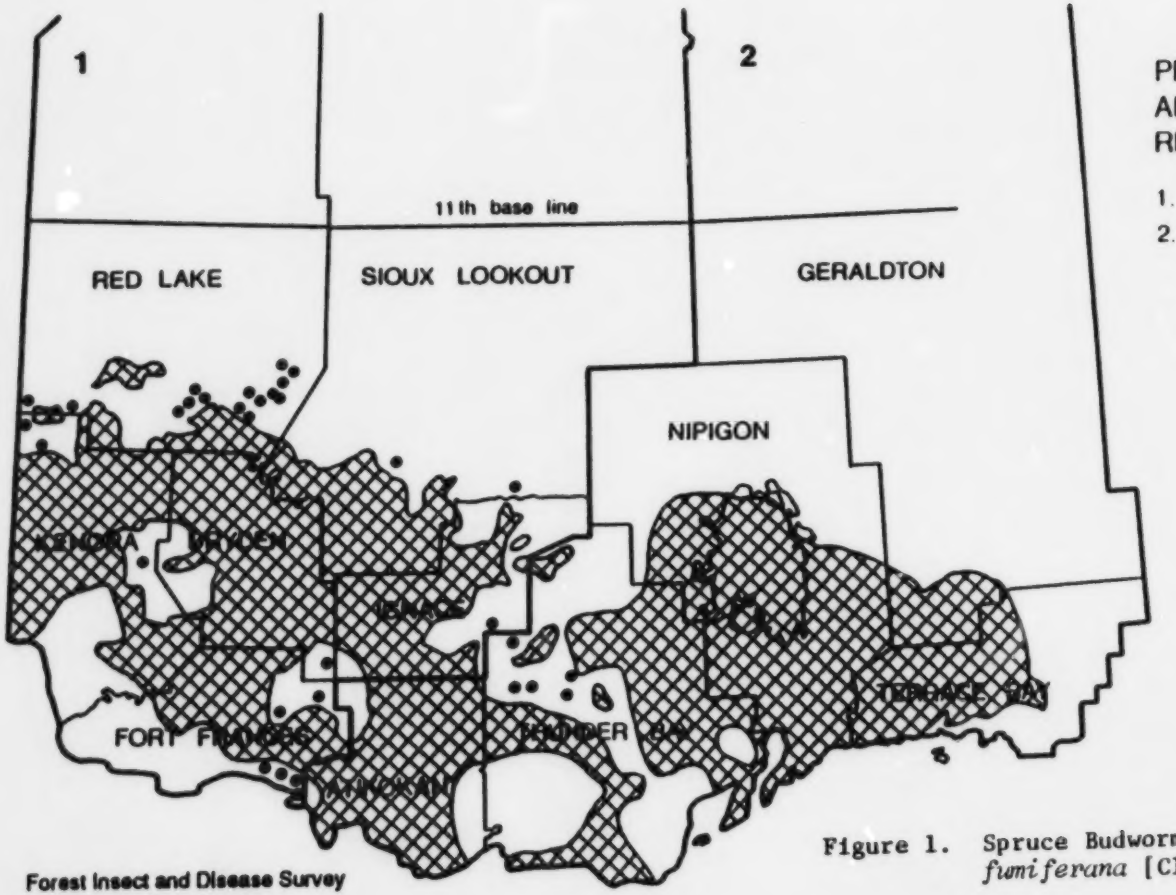
Although there were infestations on Cockburn Island in previous years, none was reported in 1987.

Large Aspen Tortrix, *Choristoneura conflictana* (Wlk.)

After 2 years of moderate-to-severe defoliation, populations of this insect collapsed at many locations in the region. Severe foliar damage was observed in Raimbault Township and at Cutler, on the Serpent River Indian Reserve in Blind River District. Both areas were less than 2 ha each, but approximately 75% of the foliage was damaged. Approximately 10 ha of immature trembling aspen *(Populus tremuloides* Michx.) were defoliated within the city of Sault Ste. Marie, and upwards of 50% of the foliage was consumed. However, not all damage was attributed to this insect, as the forest tent caterpillar *(Malacosoma disstria* Hbn.) was also present. In Espanola District, 1,500 ha of trembling aspen were defoliated at one location in Billings Township on Manitoulin Island, and another 3,000 ha were defoliated in Salter Township. Approximately 40% defoliation occurred in both townships but once again feeding by the large aspen tortrix was combined with that of the forest tent caterpillar.

Elsewhere, trace levels of this insect were observed and negligible damage occurred.

NORTHWESTERN ONTARIO



PROVINCIAL ADMINISTRATIVE REGIONS :

1. NORTHWESTERN
2. NORTH CENTRAL

Figure 1. Spruce Budworm (*Choristoneura fumiferana* [Clem.]

Areas within which moderate-to-severe defoliation occurred in 1987 ..... • or ⊠

Spruce Budworm, *Choristoneura fumiferana* (Clem.)

After several years of moderate-to-severe defoliation across the province, a decline in the area defoliated and in the intensity of the infestation occurred in 1987. The only areas of moderate-to-severe defoliation occurred in the North Central and Northwestern regions, where 7,189,763 ha of damage were aerially mapped (Fig. 1). The Northern and Northeastern regions were free of defoliation for the first time in many years as was southern Ontario, except for three small pockets that totalled 350 ha in the Bracebridge District of Algonquin Region.

On the basis of egg-mass sampling carried out in seven districts across the Northeastern Region (Table 1), no moderate-to-severe infestations are forecast for 1988.

Between 1974 and 1985, 14,067,082 ha of spruce (*Picea* spp.)/fir (*Abies* spp.) forests across the province have been killed by the spruce budworm. However, since 1986, budworm infestations have started to collapse and no new areas of mortality have been recorded. In some stands in the region, there are signs that recovery has taken place.

Table 1. Northeastern Region - Spruce Budworm: summary of defoliation estimates and egg-mass counts in 1987, and infestation forecasts for 1988.

Location	Host	Estimated defoliation, 1987 (%)	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1988[a]	Accumulated damage[b]
Blind River District (3 locations)					
Kirkwood Twp - OMNR Tree Nursery	wS	0	0	0	1
Raimbault Twp - Mississagi Prov. Pk	bF	0	0	0	5
Villeneuve Twp	wS	0	0	0	9
Espanola District (2 locations)					
Boon Twp	bF	0	22	L-M	0
Robinson Twp - Deer Yard	wS	0	0	0	-
North Bay District (3 locations)					
Jocko Twp	bF	0	8	L	9
MacBeth Twp	bF	2	0	0	2

(cont'd)

Table 1. Northeastern Region - Spruce Budworm: summary of defoliation estimates and egg-mass counts in 1987, and infestation forecasts for 1988.

Location	Host	Estimated defoliation, 1987 (%)	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1988[a]	Accumulated damage[b]
North Bay District (cont'd) (3 locations)					
Sisk Twp - Martin River Prov. Pk	bF	0	8	L	6
Sault Ste. Marie District (3 locations)					
Herrick Twp - Pancake Prov. Pk	bF	0	0	0	9
Jollineau Twp	bF	0	0	0	+
Tarbutt Additional Twp	bF	0	11	L	9
Sudbury District (3 locations)					
Antrim Twp - Halfway Lake Prov. Pk	wS	0	0	0	6
Cascaden Twp	bF	0	0	0	5
Parkin Twp	wS	1	0	0	1
Temagami District (2 locations)					
Gillies Limit Twp	wS	0	0	0	-
Strathcona Twp	bF	0	0	0	+
Wawa District (13 locations)					
Asselin Twp	bF	0	0	0	+
Challener Twp	bF	0	0	0	5
Dahl Twp - Obatanga Prov. Pk	bF	0	0	0	2
Dambrossio Twp	bF	0	0	0	+
- Impact Plot	bS	0	0	0	+
Dunphy Twp	bF	0	0	0	5

(cont'd)

Table 1. Northeastern Region - Spruce Budworm: summary of defoliation estimates and egg-mass counts in 1987, and infestation forecasts for 1988 (concl.).

Location	Host	Estimated defoliation, 1987 (%)	No. of egg masses per 9.29 m^2 of foliage	Infestation forecasts for 1988[a]	Accumulated damage[b]
Wawa District (cont'd) (13 locations)					
Lalibert Twp	bF	0	0	0	9
- Impact Plot	bS	0	0	0	9
McCron Twp - Access Rd	bF	0	0	0	3
Mikano Twp - Horsehead Lake	wS	0	0	0	0
Recollet Twp	bF	0	0	0	2
Strickland Twp	wS	1	0	0	0
White Lake Prov. Pk	bF	0	0	0	2

[a] S = severe, M = moderate, L = light, 0 = nil

[b] accumulated damage

Code	Categories
0	undamaged
1	light damage, <25% total defoliation, usually one season of severe defoliation
2	moderate damage, 25% to 60% total defoliation, 2 or 3 seasons of severe defoliation
3	severe damage, 60% to 80% total defoliation, 3 to 5 seasons of severe defoliation, will recover
4	moribund or dying, 80% to 100% total defoliation, crowns grey in appearance, top 50-150 cm dead or bare
5	< 25% of stand dead
6	25-50% of stand dead
7	50-70% of stand dead
8	> 70% of stand dead
9	< 25% of stand dead, no significant (0-25%) defoliation for several years
+	25-50% of stand dead, no significant defoliation for several years
-	51-70% of stand dead, no significant defoliation for several years

Jack Pine Budworm, *Choristoneura pinus pinus* Free.

Across the region, populations of the jack pine budworm collapsed. Only small numbers of larvae were observed on jack pine (*Pinus banksiana* Lamb.) regeneration in Lane Township, Blind River District and light feeding was observed on individual trees in Cox Township, Sudbury District and in Haddo Township, North Bay District.

In 1985, semipermanent plots were established at 13 locations in the region to monitor whole-tree mortality and bare tops in areas of moderate-to-severe defoliation. Current mortality ranges from 2 to 21% and bare tops from 2 to 27% (Table 2).

As a result of the collapse in the infestation across the region, egg-mass sampling was greatly reduced. Sampling was carried out at 22 locations (Table 3, Fig. 2) and, as indicated, no infestations are predicted for 1988.

Table 2. Summary of whole-tree mortality and bare tops associated with damage caused by the jack pine budworm in the Northeastern Region in 1986 and 1987 (counts based on the examination of 100 jack pine trees at each location).

Location (Twp)	Avg DBH (cm)	Whole-tree mortality (%) 1986	Whole-tree mortality (%) 1987	Bare tops (%) 1986	Bare tops (%) 1987
Blind River District					
Gaunt[a]	10	12	18	0	0
Lane[a]	13	4	11	0	0
Sagard	10	7	7	10	9
Winkler	15	7	10	1	2
Espanola District					
Gervais	22	11	13	6	6
Monestime Area 1	22	15	21	11	13
Monestime Area 2	13	6	10	32	27
Olinyk	24	7	13	5	5
Sudbury District					
Cartier	19	2	2	0	1
Cascaden	15	0	0	2	2
Cox	17	7	17	16	17
Hart	17	0	0	0	1
Ulster	17	4	4	2	2

[a] mortality only on suppressed trees

Table 3. Northeastern Region - Jack Pine Budworm: summary of defoliation estimates and egg-mass counts in 1987 and infestation forecasts for 1988 on jack pine.

Location	Estimated defoliation, 1987 (%)	Total no. of egg masses on six 61-cm branch tips	Standard infestation forecasts for 1988[a]	Modified infestation forecasts for 1988[b]
Blind River District (7 locations)				
Gaunt Twp - Impact Plot	0	0	N	N
Martel Twp boundary	0	0	N	N
Martel Twp - Impact Plot	4	0	N	N
Nicholas Twp	0	0	N	N
Parkinson Twp	0	0	N	N
Sagard Twp				
- Impact Plot 1	0	0	N	N
- Impact Plot 118	1	0	N	N
Espanola District (5 locations)				
Del Villano Twp				
- Stand 151	0	0	N	N
Monestime Twp				
- Impact Plot	0	0	N	N
Moses Twp - Impact Plot	0	0	N	N
Teasdale Twp				
- Impact Plot	0	0	N	N
Weeks Twp - Impact Plot	0	0	N	N
North Bay District (1 location)				
McNish Twp	0	0	N	N
Sudbury District (7 locations)				
Cartier Twp				
- Impact Plot 26	0	0	N	N
- Impact Plot 27	0	0	N	N
Cox Twp	0	0	N	N
Ermatinger Twp				
- Impact Plot	0	0	N	N
Jennings Twp	1	0	N	N
Lumsden Twp - Impact Plot	1	0	N	N
Ulster Twp - Impact Plot	0	0	N	N

(cont'd)

Table 3. Northeastern Region - Jack Pine Budworm: summary of defoliation estimates and egg-mass counts in 1987 and infestation forecasts for 1988 on jack pine (concl.)

Location	Estimated defoliation, 1987 (%)	Total no. of egg masses on six 61-cm branch tips	Standard infestation forecasts for 1988[a]	Modified infestation forecasts for 1988[b]
Wawa District (2 locations)				
Maness Twp	0	0	N	N
Recollet Twp	0	0	N	N

a N = nil, L = light, M = moderate, H = heavy

b Modified infestation forecasts: During the last major jack pine budworm outbreak in Ontario, the following standard jack pine defoliation forecast was developed:

Total egg masses on six 60-cm tips (Year X)	Defoliation forecast (Year X + 1)	Defoliation (Year X + 1) (%)
0	nil (N)	0
1-2	light (L)	1-25
3-5	moderate (M)	26-75
6+	severe (S)	76+

This relationship was found to be reliable during the first year or two of the current jack pine budworm outbreak, but in older infestations (3-4 years) it generally overestimated the defoliation potential. The "modified infestation forecast" presented in these tables is based on analysis of egg-mass counts and subsequent defoliation in 1984, 1985 and 1986 from northwestern and northeastern Ontario. The reasons for modifying the forecast are related to an increase in parasitism rates and a reduction in the production of male flowers.

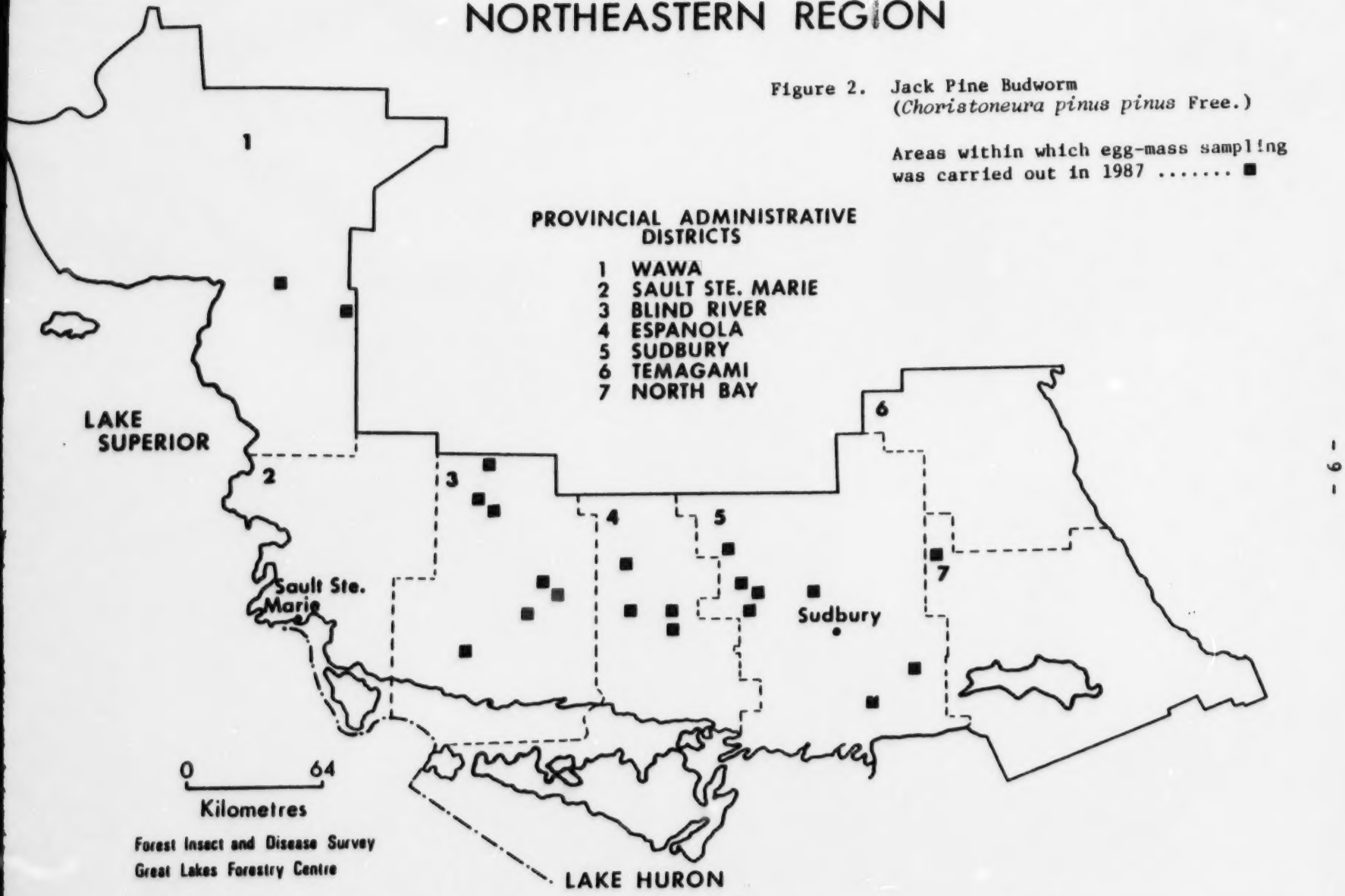


Figure 2. Jack Pine Budworm
(*Choristoneura pinus pinus* Free.)

Areas within which egg-mass sampling was carried out in 1987 ..... ■

Oak Leaf Shredder, *Croesia semipurpurana* (Kft.)

Populations of this insect remained low across the region for the third consecutive year. Surveys carried out at sample points in Tarentorus and Hilton townships, Sault Ste. Marie District, and in Long and Thessalon townships, Blind River District, revealed that defoliation of red oak (*Quercus rubra* L.) varied from 13 to 64%. However, defoliation in all of the above areas was caused by a combination of feeding by the Bruce spanworm (*Operophtera bruceata* [Hlst.]) and the forest tent caterpillar (*Malacosoma disstria* Hbn.). Light feeding by the oak leaf shredder was evident. Low numbers of oak leaf shredders were also present on open-grown red oak at Sutherland Hill in Tennyson Township, Espanola District.

Sampling conducted at the above locations for the purpose of forecasting population levels for 1988 indicated that moderate and severe defoliation could occur in Long and Thessalon townships, respectively (Table 4). Results of adult pheromone trapping are also included in the table.

Table 4. Summary of oak leaf shredder egg counts for 1986 and 1987, with 1988 infestation forecasts (egg counts based on the examination of eight 30-cm branch tips selected randomly from four trees at each location).

	Avg no. of eggs per branch tip		Forecast		Total no. of adults	
Location	1986	1987	1987	1988	1986	1987
Sault Ste. Marie District						
Tarentorus	0.0	0.8	nil	light	0	228
Hilton	0.0	0.1	nil	light	9	47
Blind River District						
Long	0.9	19.4	light	moderate	9	18
Thessalon	3.0	35.4	light	severe	279	467

Greenstriped Mapleworm, *Dryocampa rubicunda rubicunda* (Fabr.)

This insect, a pest of sugar maple (*Acer saccharum* Marsh.) and red maple (*A. rubrum* L.), caused moderate-to-severe defoliation in the region in Temagami, Sudbury and Blind River districts in 1983. Since then, however, only minimal damage has been reported throughout the region until 1987, when approximately 40 ha of red maple were 70% defoliated near Sutherland Hill in Cadeau Township, Espanola District, and 20 ha in the Elizabeth Bay area of Burpee Township on Manitoulin Island were 40% defoliated. In the Flack Lake area of Raimbault Township in Blind River District, approximately 1 ha of red maple was affected; defoliation ranging from 50 to 75% was observed in the upper crowns. Light defoliation (< 10%) was observed in the Constance Lake area of Parkinson Township; however, only single colonies were found feeding.

Birch Leafminer, *Fenusa pusilla* (Lep.)

High populations of this leafminer persisted at several locations in the region. Once again in the Latchford-Gilles-Cobalt areas of Temagami District, 80% foliar damage occurred on white birch over an area of approximately 200 ha. Pockets of severe defoliation ranging in size from 0.5 ha to 5 ha were recorded at several points in North Bay District and in the eastern portion of Sudbury District. In Sault Ste. Marie District, foliar damage (upwards of 75%) was most apparent in Fenwick Township and in the Searchmount area. In Goodville Township, Wawa District, 2 ha of roadside trees were 50 to 100% mined. Similar damage occurred on roadside trees and ornamental plantings in Blind River District.

Forest Tent Caterpillar, *Malacosoma disstria* Hbn.

Infestations of this defoliator, found primarily on trembling aspen, increased by approximately four times since 1986. A total of 1,041,745 ha was severely defoliated in 1987, in comparison with 264,965 ha in 1986 (Fig. 3, Table 5).

The largest infestation was recorded in North Bay District, where defoliation increased by 497,581 ha. The main body of damage encompassed 509,315 ha of forested land and extended northward into Temagami District, where 292,913 ha of damage occurred as far north as Hudson and Dymond townships on the Kirkland Lake District boundary.

Numerous smaller pockets of severe damage were aerially mapped in areas west and south of the main infestation. These areas varied from 20 to 16,500 ha in size, the largest being in the Hagar-Ratter-Donnet townships of Sudbury District. The infestation extended westwards through Espanola, Blind River and Sault Ste. Marie districts to the vicinity of the city of Sault Ste. Marie, and included Manitoulin

NORTHEASTERN REGION

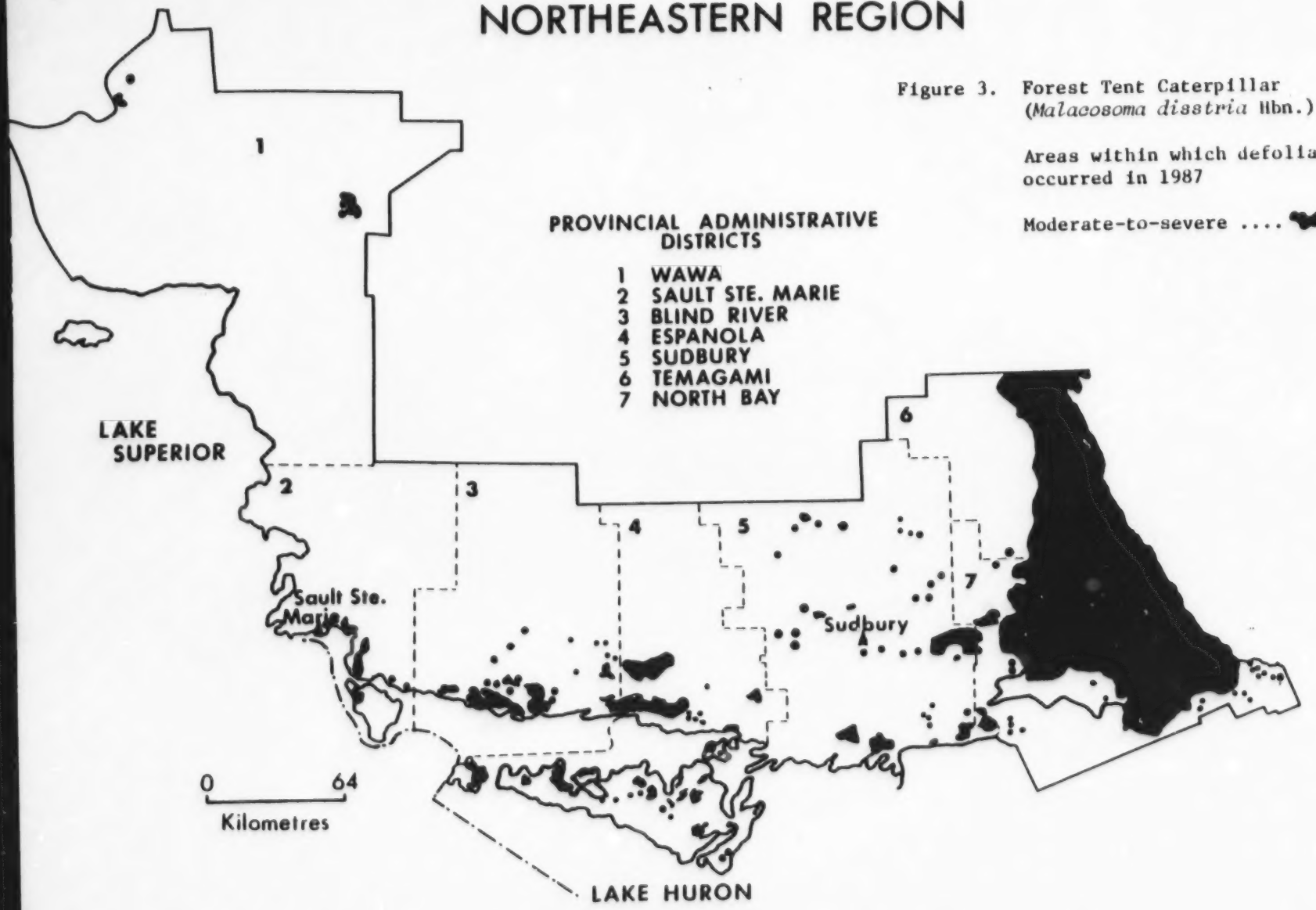


Figure 3. Forest Tent Caterpillar (*Malacosoma disstria* Hbn.)

Areas within which defoliation occurred in 1987

Moderate-to-severe .... or •

and Cockburn islands, Espanola District, and St. Joseph Island, Sault Ste. Marie District. Approximately 104,000 ha were defoliated. Farther north in the Wawa District, the infestation that occurred in 1986 near the village of Missanabie increased by 6,600 ha. Another 460 ha in the Clay Bay area of White Lake and 2,600 ha at the southern end of the lake were moderately to severely defoliated.

Dissection of caterpillar cocoons at 11 locations within the infestation (Table 6) revealed that adult emergence ranged from 28 to 63%. The pupal parasite *Sarcophaga aldrichi* Park. was present in all areas sampled; the proportion of cocoons attacked varied from 19 to 72%. An unidentified disease was detected in seven areas.

Egg-band surveys were conducted at 46 locations across the region in areas within and outside the infestation (Table 7, Fig. 4). On the basis of these surveys, it is likely that severe defoliation will recur and will spread through large areas of forest in 1988.

Table 5. Comparison of the areas of forest defoliated by the forest tent caterpillar in 1986 and 1987 in the Northeastern Region.

District	Defoliation (ha)		Change (ha)
	1986	1987	1987
Blind River	4,940	35,867	+30,927
Espanola	5,230	67,010	+61,780
North Bay	86,920	584,501	+497,581
Sault Ste. Marie	0	11,340	+11,340
Sudbury	0	39,394	+39,394
Temagami	163,540	292,913	+129,373
Wawa	14,355	10,720	-3,635
Total	274,985	1,041,745	+766,760

Table 6. Results of forest tent caterpillar cocoon dissection in four districts in the region (counts based on the dissection of 100 cocoons at each location).

Location (Twp)	Parasitized (%)	Diseased (%)	Unsuccessful (%)	Adult emergence (%)
Blind River District				
Coiber	35	2	2	61
Proctor	32	4	6	58
Thompson	46	0	5	49
Espanola District				
Salter	19	37	0	44
Billings	40	13	0	63
Temagami District				
Hudson	72	0	0	28
Olive	58	0	0	42
Strathcona	68	0	0	32
North Bay District				
Notman	27	27	0	46
Papineau	21	25	0	54
Poitras	23	30	0	47

Table 7. Results of forest tent caterpillar egg-band counts in 1987 and infestation forecasts for 1988 (counts based on the examination of one, two or three trees at each location).

Location (Twp)	Avg DBH of sample trees (cm)	No. of trees examined	Avg no. of egg bands per tree	Infestation forecasts for 1988[a]
Wawa District				
Dunphy	5.0	3	2	M
Echum	5.0	3	1	L
Laberge	13.0	2	15	H
Laberge (Dunc Lk)	16.0	3	9	H
McCron	12.0	2	11	H
West	8.0	3	3	M
Sault Ste. Marie				
Laird	9.0	3	4	M
McDonald	7.0	3	7	H
Plummer	7.0	3	8	H
St. Joseph	8.0	3	1	L
Van Koughnet	6.0	3	1	L
Blind River District				
Albanel	7.0	3	9	H
Bright	10.0	1	6	H
Kirkwood	5.0	3	7	H
Long	9.0	3	2	H
Lewis	8.0	3	3	M
Nouvel	5.0	3	6	M
Patton	5.0	3	2	M
Proctor	5.0	1	15	H
Raimbault	8.0	3	1	L
Spanish I.R.	12.0	1	17	H
Thompson	18.0	3	19	H
Wells	14.0	3	1	L
Espanola District				
Billings	17.0	1	30	H
Cadeau	15.0	3	2	L
Gerow	18.0	1	25	H
Salter	10.0	1	51	H

(cont'd)

Table 7. Results of forest tent caterpillar egg-band counts in 1987 and infestation forecasts for 1988 (counts based on the examination of one, two or three trees at each location) (concl.).

Location (Twp)	Avg DBH of sample trees (cm)	No. of trees examined	Avg no. of egg bands per tree	Infestation forecasts for 1988[a]
Sudbury District				
Bigwood	14.0	1	40	H
Hawley	10.0	3	4	L
Humboldt	13.0	1	11	H
Ratter	14.0	1	11	H
Temagami District				
Askin	13.0	1	32	H
Best	20.0	1	44	H
Coleman	10.0	1	13	H
Herbert	8.0	1	23	H
Hudson	15.0	3	7	M
Lorrain	13.0	3	7	H
Olive	15.0	1	155	H
Strathcona	13.0	1	37	H
North Bay District				
Beaucage	13.0	1	30	H
Bonfield	14.0	1	101	H
Chisholm	15.0	1	34	H
Field	16.0	1	72	H
Mattawan	15.0	1	108	H
Poitras	18.0	1	115	H
Widdifield	13.0	1	30	H

[a] L = light, M = moderate, H = heavy

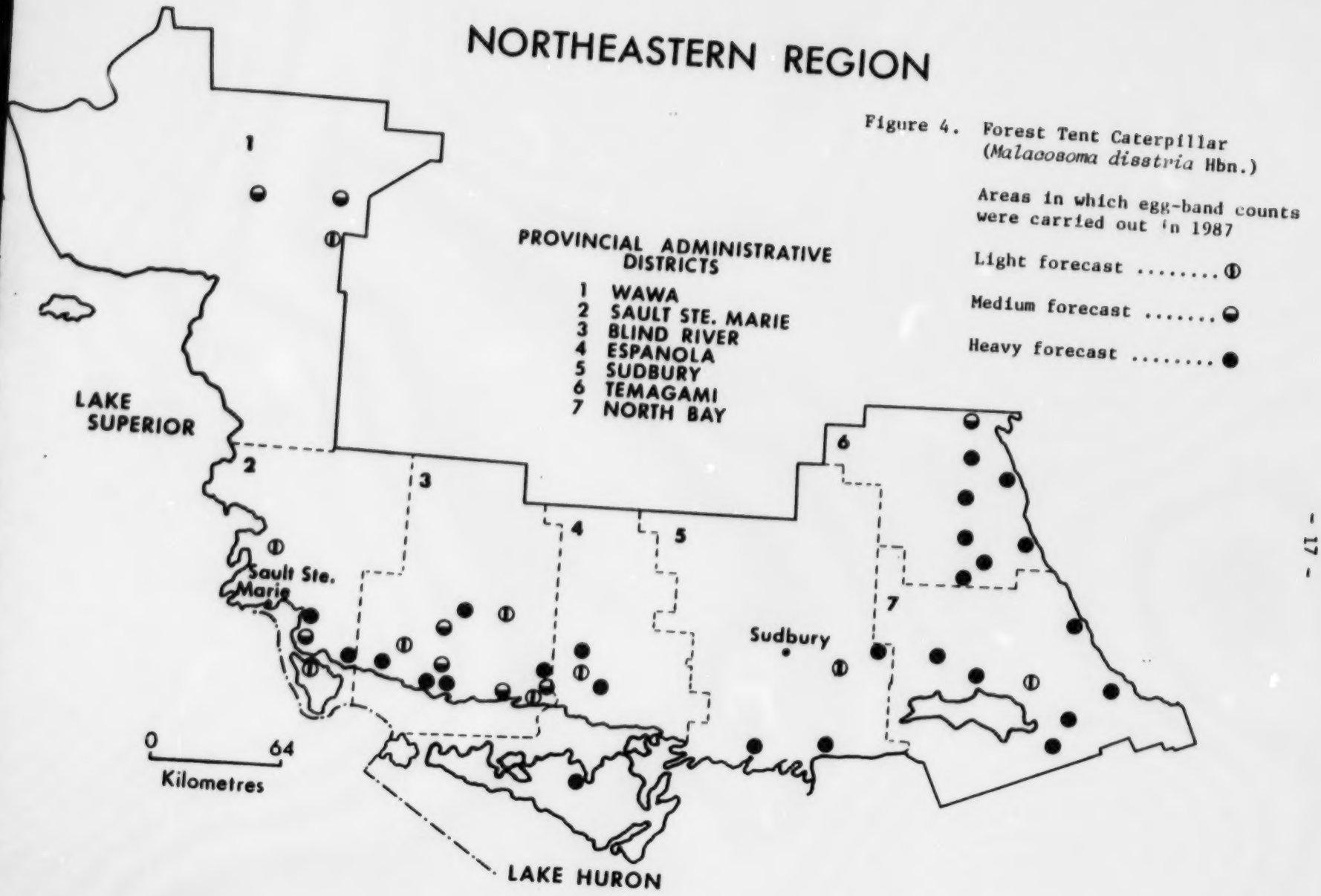


Figure 4. Forest Tent Caterpillar (*Malacosoma disstria* Hbn.)

Areas in which egg-band counts were carried out in 1987

Redheaded Pine Sawfly, *Neodiprion lecontei* (Fitch)

This insect was much more commonly observed in the region in 1987 than in the previous two years.

In the eastern portion of Sault Ste. Marie District, damage to numerous open-grown roadside and single red pine (*Pinus resinosa* Ait.) trees was evident from Garden River to the Bruce Mines area, with defoliation levels of up to 90%. In Blind River District, the insect was most prevalent at many sites in Kirkwood, Parkinson, Rose, Thompson and Bright townships. Although it was observed in plantations in many of the above townships, the incidence of trees attacked was less than 2%; however, foliar damage ranged from 5 to 100%.

In North Bay, Espanola and Sudbury districts, populations were also abundant on single and open-grown red pine and jack pine trees. In Olrig Township, North Bay District, the chemical malathion was applied to 1.8-m-tall red pine over a 30-ha area as a control measure. In this area defoliation was spotty, with upwards of 90% foliage loss on individual trees; however, pockets did not exceed 0.5 ha. In Hallam Township, Espanola District, control measures with the same insecticide were taken in a 5-ha jack pine seedling orchard with trees that averaged 0.9 m tall. Defoliation in this area was less than 30%.

This insect was not reported in Wawa or Temagami districts in 1987.

Bruce Spanworm, *Operophtera bruceata* (Hlst.)

The area infested by this defoliator of (mainly) trembling aspen and sugar maple increased sharply in 1987. A total of 202,206 ha of moderate-to-severe defoliation occurred at scattered points in Espanola, Blind River, Sault Ste. Marie and Wawa districts in comparison with 29,300 ha in 1986.

The most significant area of defoliation occurred in Sault Ste. Marie District, where a total of 158,590 ha was defoliated. The largest pocket of damage, which totalled 95,600 ha, occurred north and east of the city of Sault Ste. Marie (Fig. 5). Numerous smaller pockets, ranging in size from approximately 50 to 14,900 ha, were mapped outside this main body. The infestation on St. Joseph Island, Sault Ste. Marie District, which has persisted for the past four years, declined to low levels. Moderate-to-severe defoliation of 1500 ha, mainly understory sugar maple trees, occurred throughout the eastern part of the island.

A large pocket of approximately 22,285 ha, consisting mainly of maple and, to a lesser degree, trembling aspen, was moderately to severely defoliated in parts of eight townships in the southwestern corner of Blind River District. Smaller pockets occurred around Wakomata, Constance and Casselman's lakes. In Espanola District, defoliation was confined mainly to Manitoulin and Cockburn islands, where 1,843 ha of

(cont'd)

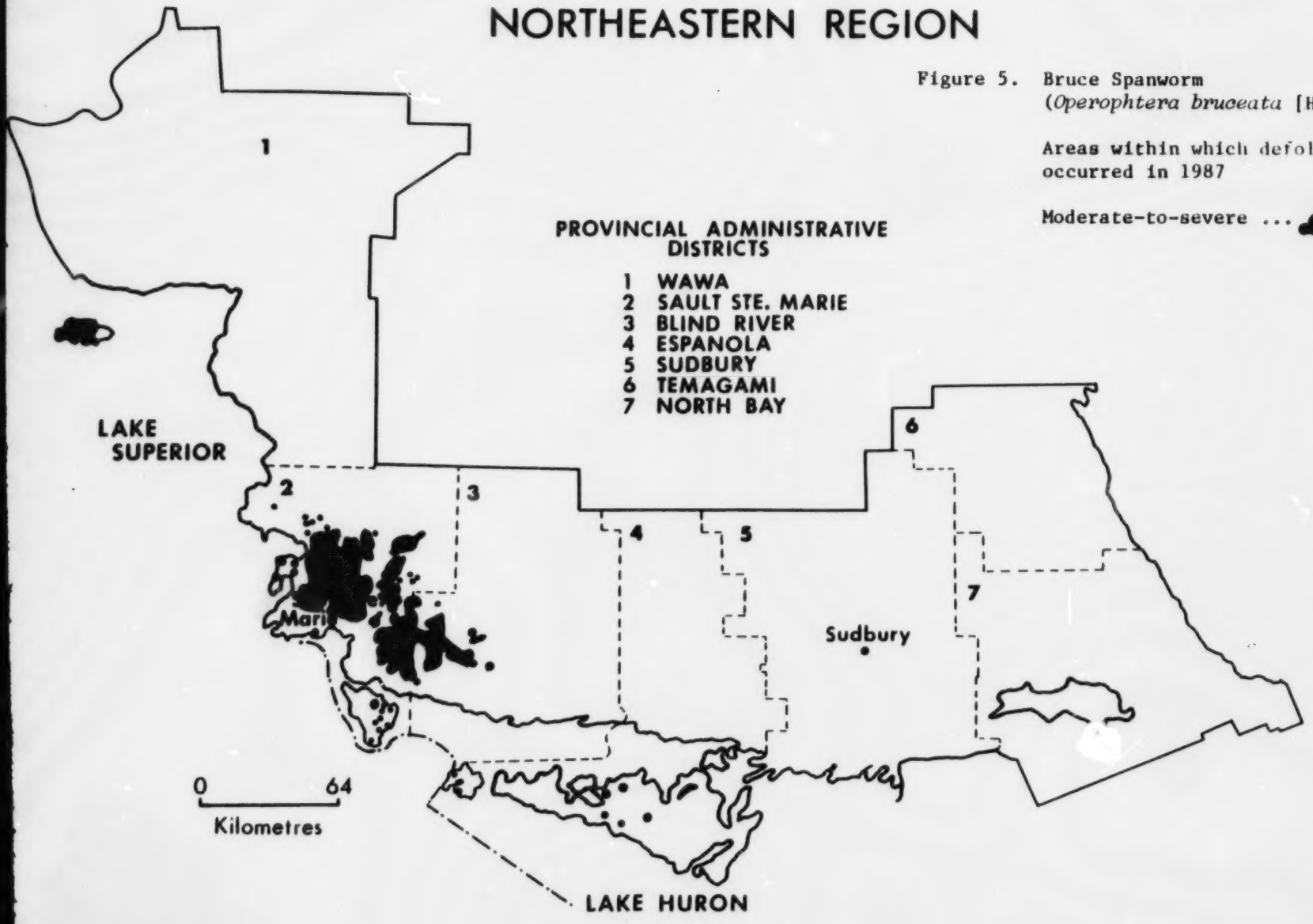


Figure 5. Bruce Spanworm (*Operophtera bruceata* [Hlst.])

Areas within which defoliation occurred in 1987

Moderate-to-severe ... or •

Bruce Spanworm, *Operophtera bruceata* (Hlst.) (concl.)

sugar maple exhibited upwards of 80% foliar damage. In Wawa District, damage was confined to Michipicoten Island, where 15,250 ha of sugar maple were defoliated.

Past infestations of this defoliator in the Northeastern Region have been reported only in Sault Ste. Marie District. Severe defoliation was reported in 1965 and 1966 in Kincaid, Ryan, Palmer, Brule and Olsen townships north of Pancake Bay; in 1973 in Jocelyn Township on St. Joseph Island; and in 1975 and 1976 in Van Koughnet Township in the Goulais River area. Previous infestations in Sault Ste. Marie District have been of one or two years' duration only, and in other parts of the province they have lasted no more than three years, after which a collapse occurs. It is anticipated that defoliation will continue in the more recently infested areas, but a decline is possible in 1988 in the older areas of the infestation.

Once again a ground beetle predator of the Bruce spanworm, *Calosoma frigidum* Kby., was found commonly in all of the infested areas. However, the effect of these predators on spanworm populations is unknown.

Yellowheaded Spruce Sawfly, *Pikonema alaskensis* (Roh.)

Population levels of this sawfly fluctuated across the region. Throughout the districts of Blind River, Sault Ste. Marie and Wawa, it was observed mostly on single trees or small clumps of trees and no infestations were evident in plantations. Defoliation varied from 10 to 100% on single trees, especially on ornamentals such as Colorado blue spruce (*Picea pungens* Engelm.) in the towns of Wawa and Blind River and in many areas within the city of Sault Ste. Marie.

In Espanola, North Bay and Temagami districts this insect was more prevalent. For the third consecutive year in these districts approximately 250 black spruce (*Picea mariana* [Mill.] B.S.P.) and white spruce (*P. glauca* [Moench] Voss) trees that averaged 2 m in height suffered from 10 to 90% defoliation. Similar damage was reported at numerous points along roadsides and in fields in Latchford and New Liskeard districts. An evaluation in a 2-ha spruce plantation in East Mills Township, North Bay District, revealed that 33% of trees 2 m tall sustained an average of 10% defoliation. Numerous ornamental plantings in the city of Sudbury sustained foliar damage ranging from 10 to 100%.

This insect can kill young trees under 2 m tall after two or three years of complete defoliation and can be a serious threat in young spruce plantations.

White Pine Weevil, *Pissodes strobi* (Peck)

Leader damage, as determined by quantitative sampling at 21 points across the region, ranged from 1 to 20% (Table 8). At one location in Burwash Township, Sudbury District, 20% of the trees in a Scots pine (*Pinus sylvestris* L.) windbreak had dead leaders.

In Tennyson Township, Espanola District, control measures were carried out in a 60-ha Scots pine plantation. The chemical methoxychlor was applied by ground crews; however, results will not be obtained until 1988, when counts are taken to determine population levels. In Pardo Township, North Bay District, control measures were carried out in a 30-ha white pine (*Pinus strobus* L.) plantation. At this site, a group of OMNR Junior Rangers hand clipped and burned infested shoots. The results of this operation will be determined in the summer of 1988.

Table 8. Damage by the white pine weevil in plantations in the Northeastern Region from 1985 to 1987 (counts based on the examination of 150 randomly selected pine trees at each location).

Location (Twp)	Host(s)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Leaders attacked (%) 1985	1986	1987
Wawa District							
Recollet	jP	100	2,500	3.9	-	1.0	2.0
Maness	jP	50	1,600	2.1	-	-	2.0
Sault Ste. Marie District							
Hurlburt	jP	50	3,000	3.0	-	1.0	8.0
Blind River District							
Villeneuve	jP	50	3,000	2.3	1.0	5.0	2.0
Haughton	jP	50	2,500	1.7	2.0	6.0	7.0
Timbrell	jP	50	2,500	2.9	1.0	5.0	8.0
Wardle	jP	4	1,500	4.0	-	-	2.0
Sagard	jP	50	1,600	2.5	-	1.0	3.0
Espanola District							
Tennyson	ScP	60	670	4.8	-	14.0	7.0
Salter[a]	wS	10	3,554	4.0	-	-	2.0
Foster	wS	10	1,550	5.7	-	-	3.0
Sudbury District							
Burwash[a]	wS	2.5	3,334	2.9	-	-	6.0
Burwash	ScP	3.0	2,000	4.2	-	-	20.0
Burwash	wP	10.0	3,777	2.5	-	-	13.0
Cosby	wP	15.0	1,340	5.0	-	3.0	3.0
Drury	wP	3.0	3,333	4.0	-	-	4.0
Servos	wP	.5	2,375	1.5	-	-	3.0
Servos	jP	1.0	1,750	2.5	-	-	1.0
North Bay District							
Pardo	wP	30.0	2,125	1.8	-	-	1.0
Temagami District							
Selby	jP	50	4,000	1.8	-	-	14.0
Milne	jP	100	3,500	1.2	-	-	9.0

[a]white spruce plantation survey

Minor Insects

Jack Pine Tip Beetle, *Conophthorus banksianae* McP.

High populations of this insect were observed at three locations in Blind River District. Evaluations performed in Lane and Timbrell townships revealed that between 25 and 58% of the trees had been attacked (Table 9). In Lane Township, 38% more trees were affected than had been in 1986. Since 1984, leader damage has averaged 6%.

Table 9. Damage by the jack pine tip beetle in the Northeastern Region in 1986 and 1987 (counts based on the examination of 150 randomly selected trees at each location).

Location	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Trees affected (%)		Leaders attacked (%)	
				1986	1987	1986	1987
Sault Ste. Marie District							
Hurlburt	50	5,000	2.5	2.6	4.7	0.6	0.0
Blind River District							
Lane	50	3,000	2.5	15.3	40.6	0.6	8.7
Lane	25	3,000	2.5	20.6	58.0	7.3	8.0
Timbrell	20	2,500	2.6	-	25.3	-	2.7
Sagard	10	1,200	1.7	-	6.0	-	1.3

Early Birch Leaf Edgeminer, *Messa nana* (Klug)

This introduced insect was collected for the first time in Sault Ste. Marie District at two locations. Light leafmining occurred along the Voyageur Trail in Korah Township and moderate damage occurred on roadside trees in the Hiawatha Park area in Tarentorus Township. The insect first appeared in the region in Sudbury District in 1985. This new record represents approximately a 300-km westerly extension of distribution in the region. Populations were heavy in McKim and Neelon townships, Sudbury District, especially on open-grown white birch trees. Small numbers were observed in Hugel and Patterson townships, North Bay District.

Table 10. Other forest insects

Insect	Host(s)	Remarks
Acrobasis betulella Hlst. Birch tubemaker	wB	Defoliation averaged 25% on 10 ha of open-grown trees in McKim Twp, Sudbury District. Lower levels of defoliation were recorded commonly throughout Temagami, Sudbury and Espanola districts.
Alsophila pometaria (Harr.) Fall cankerworm	Ba	An average of 35% defoliation was recorded over a 20-ha stand in Restoule Prov. Park, Patterson Twp, North Bay District.
Altica ambiens alni Harr. Alder flea beetle	Alder	Numerous pockets of 75-100% defoliation were observed throughout the central and southern portions of Temagami District.
Aphrophora cribrata (Wlk.) Pine spittlebug	jP, wP, tL	Shoot damage of 35% was recorded over a 1-ha area of tamarack *(Larix laricina* [Du Roi] K. Koch) in Assiginack Twp, Espanola District. Similar damage was recorded over 15 ha of jack pine in Patterson Twp, North Bay District and over 2 ha of white pine on Birch Island, Espanola District.
Archips cerasivorana (Fitch) Uglynest caterpillar	cCh	Heavy defoliation (80-100%) was recorded in two 0.2-ha areas, one in Gurd Twp, North Bay District and the other in Allan Twp, Espanola District. High numbers of tents were recorded in Kars Twp and on St. Joseph Island, Sault Ste. Marie District.
Caliroa cerasi (L.) Pear sawfly	English hawthorn, mountain-ash	As much as 75% defoliation was recorded at a number of locations across the city of Sault Ste. Marie.
Caliroa sp. prob. *fasciata* (Nort.) Oakslug sawfly	rO	Moderate skeletonizing was recorded on single trees in Tarentorus and Hilton twps, Sault Ste. Marie District and in Rainbow and Bright Additional twps, Blind River District.

(cont'd)

Table 10. Other forest insects (cont'd)

Insect	Host(s)	Remarks
Conophthorus resinosae Hopk. Red pine cone beetle	wP, rP	Large numbers of cones were damaged on mature and overmature trees in shoreline stands on Lake Temagami.
Epinotia solandriana L. Birch-aspen leafroller	wB, bPo	Moderate damage to approximately 40% of the crowns was recorded at a number of locations in Blind River, Sudbury and Espanola districts. Lighter damage was recorded commonly throughout the Temagami District.
Erannis tiliaria (Harr.) Linden looper	rO, sM	30-60% defoliation recorded in a 12-ha stand of red oak in Sheguiandah Township, Espanola District and in 2.5 ha of sugar maple in Trill and Killarney twps, Sudbury District
Eucosma gloriola Heinr. Eastern pine shoot borer	wP	Damage in pine stands across the region averaged 1% on the current leaders. The proportion of trees affected ranged from 0% to a high of 17.3% in Burwash Twp, Sudbury District.
Malacosoma americanum F. Eastern tent caterpillar	Ch	Heavy damage was recorded along a 4-km section of bush road in Baldwin Twp, Espanola District. Populations continued to increase throughout the remainder of Espanola and Sudbury districts.
Neodiprion abietis complex Balsam fir sawfly	bF	An average of 50% defoliation was recorded over areas up to 0.5 ha in size in Day and Bright Additional twps, Blind River District and in Plummer Additional Twp, Sault Ste. Marie District. Similar damage was recorded on single trees in the western portion of the city of Sault Ste. Marie.

(cont'd)

Table 10. Other forest insects (cont'd)

Insect	Host(s)	Remarks
Neodiprion nanulus nanulus Schedl. Red pine sawfly	rP, jP	A group of 50 trees, each approximately 13 cm in diameter, exhibited 30% defoliation on an island in Lake Temagami. Light defoliation was recorded on ornamental red pine plantings in Antoine and Martin River prov. parks, North Bay District; and in Windy Lake Prov. Park and in Cox Twp, Sudbury District.
Neodiprion pratti banksianae Roh. Jack pine sawfly	jP	Light defoliation (approx. 5%) was recorded in young pine stands in Wells and Raimbault twps, Blind River District, in Antoine Twp, North Bay District and in Carlyle Twp, Sudbury District.
Neodiprion sertifer (Geoff.) European pine sawfly	scP	Defoliation of 80% was recorded in a 0.2-ha clump of pine in Gordon Twp, Espanola District. Defoliation ranging from 25 to 75% was sporadically recorded in Billings, Allan and Gordon twps, Sudbury District and on ornamentals in the city of Sault Ste. Marie.
Neodiprion swainei Midd. Swaine jack pine sawfly	jP	Light populations were once again recorded along the shoreline of Lake Temagami. Light damage was recorded along the southeastern shore of Barlow Lake in Jennings Twp and along the French River in Bigwood Twp, Sudbury District.
Neodiprion virginiana complex Redheaded jack pine sawfly	jP, rP	Light defoliation (10-20%) was recorded in areas up to 0.2 ha in size in Proctor Twp, Blind River District and on Birch Island, Espanola District.

(cont'd)

Table 10. Other forest insects (concl.)

Insect	Host(s)	Remarks
Petrova albicapitana (Busck.) Northern pitch twig moth	jP	In Blind River District two plantations of 2-m-tall trees were lightly defoliated. A 2-ha plantation in Hembruff Twp had 4% of its trees affected and a 50-ha plantation in Haughton Twp had 14% of its trees affected.
Pristiphora erichsonii (Htg.)	tL	One small pocket of 25% defoliation was recorded on trees adjacent to Maki Road in Korah Twp, Sault Ste. Marie District.
Pristiphora geniculata (Htg.) Mountain ash sawfly	aMo	Ornamentals across the city of Sault Ste. Marie suffered between 10 and 100% defoliation. Low levels of damage were recorded commonly in Temagami and North Bay districts.
Sparganothis sulfureana Clem. Needletier	rP	Defoliation of approximately 35% was recorded in a 1-ha plantation of 1.5-m-tall trees in Allan Twp, Espanola District.
Toumeyella parvicornis (Ckll.) Pine tortoise scale	jP, scP	Heavy damage was recorded at two locations in the Blind River District: on the fringe trees in a jack pine stand in Bridgland Twp and in an older Scots pine plantation in Lefroy Twp.

TREE DISEASES

Major Diseases

Armillaria Root Rot, *Armillaria mellea* (Vahl:Fr.) Kummer

This disease organism was observed in numerous areas across the region. Although a standard disease evaluation was not carried out, a random check within a 0.5-ha jack pine plantation in Hunt Township, Wawa District, revealed 8% current mortality among trees 1.8 m tall. Elsewhere in the region, evaluations performed in plantations indicated that mortality was less than 3% (Table 11).

Table 11. Current mortality caused by Armillaria root rot in six plantations in the region (counts based on the examination of 150 randomly selected trees at each location).

Location (Twp)	Host(s)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Current mortality (%)
Wawa District					
Esquega	jP	500	3,000	0.6	1.3
Sault Ste. Marie District					
Hurlburt	jP	50	3,000	2.5	0.0
Blind River District					
Haughton	jP	50	2,500	1.7	1.3
Parkinson	rP	2	2,500	1.6	0.7
Viel	rP	4	3,000	1.0	0.0
North Bay District					
Olrig-OMNR Seedling Orchard	rP	10	2,125	1.8	2.7

Scleroderris Canker, *Ascocalyx abietina* (Lagerb.) Schläpfer-Bernhard

In North America, two races of this fungus are present: the North American race, which attacks young trees and does little damage to trees more than 2 m tall, and the European race, which kills trees in all height classes. A comparison of the two races is presented in Table 12.

In 1987, as in previous years, numerous checks across the entire region failed to reveal the more virulent European race. However, the North American race was again observed attacking between 0.7% and 76% of the trees in the region. Damage was confined to the lower branches and mortality was less than 2% (Table 13).

Table 12. A comparison of the North American and European races of Scleroderris canker[a].

European Race	North American Race
1. Needle bases turn red or yellow in May or June.	1. Same
2. All needles on infected branches turn brown in summer.	2. Same
3. Entire branches may be killed in a single year.	3. One internode is killed per year, from the tip toward the main stem.
4. The tree dies when all or most of the crown has been killed.	4. The fungus grows along a branch to the main stem, which is girdled or cankered. Massive shoot mortality results in the death of only small trees.
5. A bright green stain may occur just beneath bark on killed stems.	5. Same
6. Infected branches can be found 20 m or more above ground.	6. Infection seldom occurs more than 2 m above ground.
7. Mature trees are killed in 2 to 4 years.	7. Damage is confined to the lower crown of mature trees.
8. Trees do not exhibit basal cankers on the main stem.	8. Trees may bear basal cankers up to 2 m long on the main stem.
9. Cuplike fruiting structures are rare.	9. Cuplike fruiting structures are abundant.
10. Pine, spruce, larch (*Larix* spp.) and Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco) are affected.	10. Pine and possibly spruce are affected.

[a]information provided by H.L. Gross and C.E. Dorworth

Table 13. Summary of damage caused by Scleroderris canker in the Northeastern Region in 1987 (counts based on the examination of 150 randomly selected pine trees at each location).

Location (Twp)	Host(s)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Trees affected (%)	Mortality (%)
Sault Ste. Marie District						
Ryan	jP	1	1,200	1.8	2.0	2.0
Blind River District						
Galbraith	rP	5	3,000	3.0	76.0	0.0
Haughton	rP	10	1,600	1.3	0.7	0.0
Haughton	rP	10	2,500	2.2	60.0	0.7
Kirkwood	rP	5	2,500	1.8	8.6	0.0
Timbrell	rP	10	3,000	1.2	0.0	0.0

Western Gall Rust, *Endocronartium harknessii* (J.P. Moore) Y. Hirats.

Damage by this gall-forming pathogen was extremely heavy in one area evaluated in Blind River District (Table 14). An evaluation revealed that 52% of jack pine trees were infested at one location in Lane Township and 17% of these trees were severely galled (trees with infection on main stem, or on 25% of the branches). Elsewhere in Blind River District, the percentage of trees attacked varied from 1.3 to 5.3%.

Unusually high numbers of galls were also observed on trees in the 1-m to 3-m height class in Durban, Carlyle and Jocko townships of Espanola, North Bay and Sudbury districts, respectively. No alternate host is required for completion of this rust's life cycle.

Table 14. Damage by the western gall rust in 1987 (counts based on the examination of 150 randomly selected trees at each location).

Location (Twp)	Host(s)	Estimated area of stand (ha)	Estimated no. of trees per ha	Avg ht of trees (m)	Trees affected (%)	Trees[a] severely affected (%)
Wawa District						
Recollet	jP	100	3,900	2.9	0.0	0.0
Sault Ste. Marie District						
Hurlburt	jP	50	3,900	0.7	0.0	0.0
Blind River District						
Haughton	jP	10	1,600	1.6	5.3	0.0
Lane	jP	25	2,500	1.2	52.3	17.3
Sagard	jP	10	1,200	1.7	1.3	0.0
Timbrell	jP	50	3,000	2.4	0.0	0.0
Villeneuve	jP	50	4,400	1.3	0.0	0.0

[a] stem galls

Table 15. Other forest diseases.

Disease	Host(s)	Remarks
Apiognomia errabunda (Roberge) Höhnel Leaf anthracnose	sM, mM	Moderate infection levels were recorded in the Rock Lake area in Plummer Twp, Sault Ste. Marie District. Lighter infection levels were observed near Sinclair Cove in Labelle Twp, Wawa District.
Apiosporina collinsii (Schwein.) Höhnel Apiosporina witches' broom	Se	A high incidence of infection was recorded on roadside trees in Hiawatha Park in Tarentorus Twp, Sault Ste. Marie District.
Ciborinia whetzelii (Seaver) Seaver Ink spot of aspen	tA	Heavy foliar damage was recorded on pockets of 2-20 trees at numerous locations throughout Temagami, North Bay and Sudbury districts.
Coleosporium asterum (Dietel) Sydow Pine needle rust	rP	A 50-ha plantation of 1.8-m-tall trees in Bright Additional Twp, Blind River District suffered an average of 2.2% foliar damage. The incidence level of the disease was 45%.
Cronartium quercuum (Berk.) Miyabe ex Shirai f. sp. *banksianae* Eastern gall rust	rO	Moderate infection levels were recorded on red oak in Hiawatha Park in Tarentorus Twp, Sault Ste. Marie District. This constitutes the first record of the disease in Sault Ste. Marie District.
Cronartium ribicola J.C. Fischer White pine blister rust	wP	An evaluation of a 10-ha plantation of 1.5-m-tall trees in Olrig Twp, North Bay District revealed a 5% infection level and severe damage (stem infections) to 2% of the trees.
Cladiosporium sp. A leaf spot	tA	Foliar damage amounting to 80% was recorded over a 2-ha stand in Plummer Twp, Sault Ste. Marie District.

(cont'd)

Table 15. Other forest diseases (concl.).

Disease	Host(s)	Remarks
Davisomycella ampla (J. Davis) Darker Tar spot needle cast	jP	Foliar damage amounting to 70% was recorded at two locations in Espanola District. Lower levels of infection were recorded occasionally in North Bay and Sault Ste. Marie districts.
Foveostroma abietinum (Peck) DiCosmo Twig canker	bF	Approximately 30% of the natural regeneration was affected over a 20-ha area of Agawa Prov. Park, Wawa District.
Lophodermium spp. Needle cast	rP	An average of 25% defoliation was recorded in a 40-ha plantation of 2.5-m-tall trees in Gurd Twp, North Bay District.
Lophophacidium dooksii Corlett & R. Shoem. Needle blight	wP	Moderate damage was recorded in Blind River District in the Otter Lake area of Poulin Twp and in Mississagi Prov. Park.
Melampsora medusae Thüm. Larch-poplar rust	tL	Defoliation levels of 25% were recorded throughout a 0.5-ha stand in Samuel de Champlain Prov. Park, Calvin Twp, North Bay District.
Septoria betulae Pass. Leaf blight	wB	Defoliation as high as 90% was recorded in North Bay, Sudbury and Espanola districts and at one location in Wawa District.
Sirococcus conigenus (DC.) P. Cannon & Minter Shoot blight	rP	Approximately 50% of the regeneration was affected over a 20-ha area in Agawa Campgrounds, Lake Superior Park, Wawa District.
Sphaeropsis sapinea (Fr.) Dyko & B. Sutton Tip blight	ScP	An incidence level of 80% was recorded in a plantation in Lefroy Twp, Blind River District.
Venturia inaequalis (Cooke) Winter Apple scab	flowering crab	Defoliation as high as 80% was recorded on ornamentals in the town of Wawa.

ABIOTIC DAMAGE

Drought

In 1987, higher-than-normal temperatures and lower-than-normal precipitation (see Table 21) caused very dry conditions throughout the region. As a result, white birch trees growing along ridges and on rocky sites lost foliage prematurely, especially from the Searchmont area north to Ogidaki along the Algoma Central Railway, Sault Ste. Marie District. This situation was also observed at several points in Nouvel Township in Blind River District.

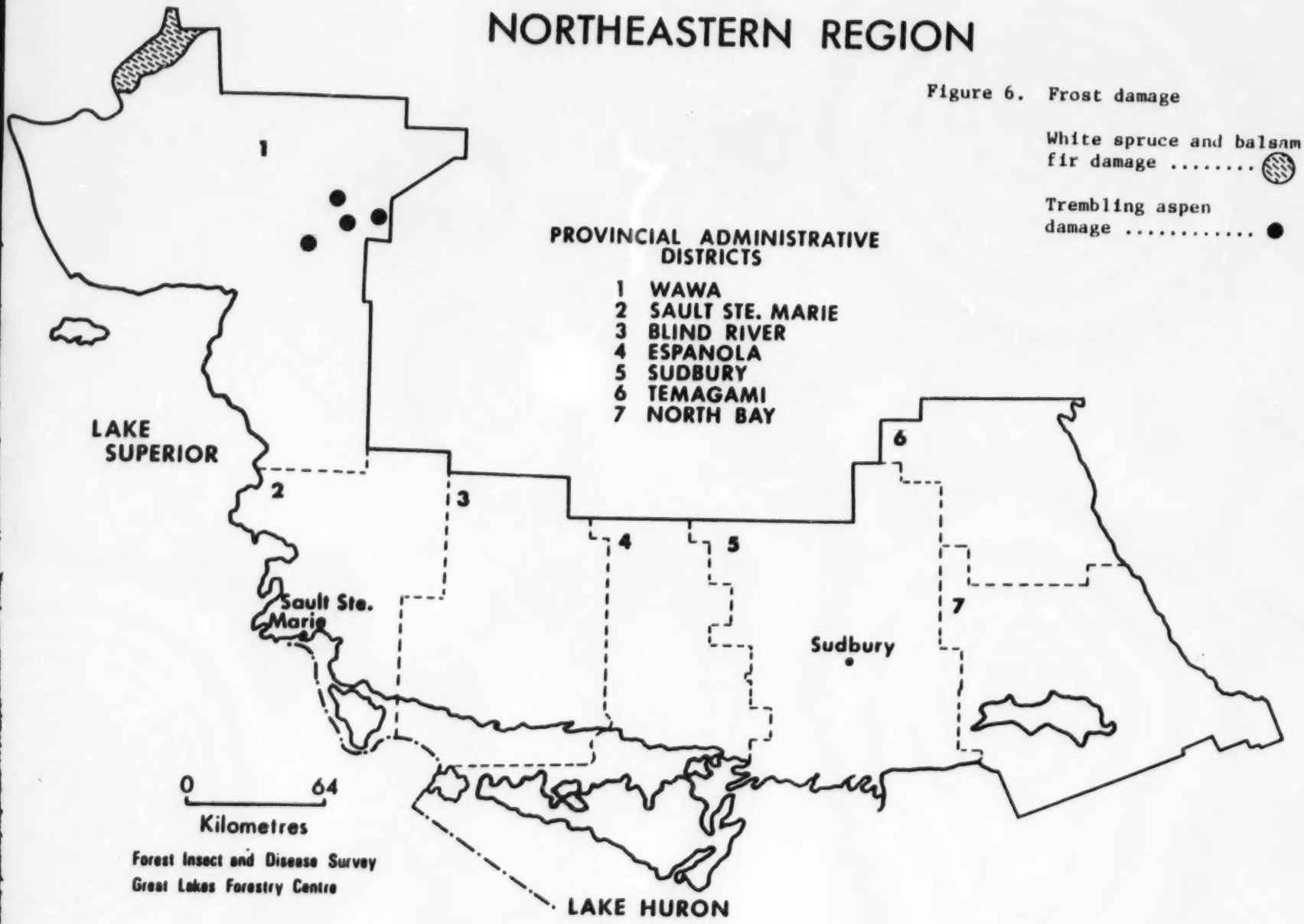
Yellow birch (*Betula alleghaniensis* Britt.) along the Trans-Canada Highway from the Montreal River area in Sault Ste. Marie District north to the town of Wawa was also affected. Trees in this area lost most of their foliage, especially in the upper third of the crown, by mid-August.

Drought was also very noticeable on balsam poplar (*Populus balsamifera* L.) throughout the region. Premature leaf drop was observed at numerous locations and was accentuated by high populations of the poplar flea beetle (*Macrohaltica populi* [Brown]). This condition was especially noticeable from the town of Spanish eastward to the Whitefish area of Espanola District and north to Fairbanks Provincial Park in Sudbury District. Similar damage occurred along Highway 17 between the city of North Bay and the town of Mattawa in North Bay District.

This problem was not observed on other conifers or deciduous trees in the region.

Frost

As a result of cold temperatures ranging from 0° to 5°C between 22 and 25 May 1987, severe frost damage was reported in several areas of Wawa District (Fig. 6). Aerial surveys revealed moderate-to-severe foliar damage on trembling aspen in the Dalton area, west to Pivot Lake, in Cowie Township and north to approximately Poachers Bay on Wabatongushi Lake in Glasgow Township. Approximately 4,500 ha of aspen were affected within this area and pockets varied from 40 to 600 ha. A large portion of the Missanabie area sustained damage both by frost and by the forest tent caterpillar. Ground checks in several areas around Dog Lake indicated that foliar damage caused by frost amounted to 75-100% and, as the summer progressed, premature leaf drop occurred in many of the affected stands. In the northwestern corner of the district, both white spruce and balsam fir (*Abies balsamea* [L.] Mill.), especially the latter, sustained varying degrees of foliar damage within an area of approximately 51,000 ha.


NORTHEASTERN REGION
Figure 6. Frost damage
White spruce and balsam fir damage .....
Trembling aspen damage .....
PROVINCIAL ADMINISTRATIVE DISTRICTS
1 WAWA
2 SAULT STE. MARIE
3 BLIND RIVER
4 ESPANOLA
5 SUDBURY
6 TEMAGAMI
7 NORTH BAY
LAKE SUPERIOR
Sault Ste. Marie
Sudbury
LAKE HURON
0 64
Kilometres
Forest Insect and Disease Survey
Great Lakes Forestry Centre

In Espanola District, both white spruce and balsam fir shoots were killed in Tennyson, Salter, and Foster townships. The proportion of trees affected was approximately 3%, and foliar damage ranged from 2 to 5%. In the white spruce plantation survey carried out in 12 plantations (Table 16) across the region, from 3 to 44% of the trees were affected; however, foliar damage was less than 2%.

Elsewhere in the region, damage occurred in several areas but only at trace levels.

Table 16(a). Summary of the incidence of insect damage in a survey conducted in white spruce plantations across the Northeastern Region in 1987 (counts based on the examination of 150 randomly selected trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Average height of trees (m)	Spruce budworm Trees affected (%)	Spruce budworm Foliage affected (%)	Spruce cone worm Trees affected (%)	Zeiraphera sp. Trees affected (%)	Yellowheaded spruce sawfly Trees affected (%)	Yellowheaded spruce sawfly Foliage affected (%)
North Bay									
Gurd	2.0	4221	4.9	0	0	0	6.7	0	0
East Mills	2.0	1778	1.3	0	0	0	.7	32.6	10.0
Sudbury									
Burwash	2.5	3334	2.9	0.7	1	0	0	2.7	5.0
Killarney	2.0	4221	6.3	0	0	0	1.3	2.0	10.0
Espanola									
Salter	10.0	3554	4.0	0.7	1	0	1.3	1.3	5.0
Dawson	5.0	4221	8.7	2.0	1	0	0	8.0	2.0
Wawa									
Lendrum	10.0	2500	3.7	0.4	1	2.6	76.0	0	0
Blind River									
Lefroy	1.0	2500	.7	0	0	0	0.1	4.6	1.4
Haughton	20.0	1800	1.6	0.7	1	0	0	9.3	0.1
Kirkwood	15.0	2500	3.9	0	0	0	0.1	4.0	1.0
Patton	3.0	2000	6.8	0	0	0	100.0	10.6	1.2
Wells	10.0	2500	6.0	0	0	0	100.0	0	0

Table 16(b). Summary of the incidence of insect and disease damage in a survey conducted in white spruce plantations across the Northeastern Region in 1987 (counts based on the examination of 150 randomly selected trees at each location).

Location (Twp)	Estimated area of stand (ha)	Estimated no. of trees per ha	Average height of trees (m)	White pine weevil Leaders attacked (%)	Needle rust Trees affected (%)	Needle rust Foliage affected (%)	Frost damage Trees affected (%)	Frost damage Foliage affected (%)	Armillaria root rot Trees affected (%)
North Bay									
Gurd	2.0	4221	4.9	0	12	1.0	0	0	0
East Mills	2.0	1778	1.3	0	0	0.0	0	0	0
Sudbury									
Burwash	2.5	3334	2.9	2.7	33	30.0	0	0	0
Killarney	2.0	4221	6.3	0	1	1.0	0	0	0
Espanola									
Salter	10.0	3554	4.0	2.0	13	5.0	3	2.0	0
Dawson	5.0	4221	8.7	0	1	0	0	0	0
Wawa									
Lendrum	10.0	2500	3.7	0	100	1.7	29	1.0	0
Blind River									
Lefroy	1.0	2500	.7	0	0	0	0	0	0
Haughton	20.0	1800	1.6	4.7	0	0	44	1.6	0
Kirkwood	15.0	2500	3.9	0	0	0	36	1.0	0
Patton	3.0	2000	6.8	0	0	0	0	0	0
Wells	10.0	2500	6.0	0	5	1.0	25	1.0	0

SPECIAL SURVEYS

Gypsy Moth, *Lymantria dispar* (L.)

Surveys continued in the region for the purpose of detecting and monitoring the spread of this insect. In all, 140 pheromone traps were deployed at 27 widely scattered points (Fig. 7). In addition, 50 burlap traps (10 at each location) were placed at Killarney Provincial Park, Sudbury District, at South Bay Mouth, Espanola District and at Antoine, Samuel de Champlain and Restoule provincial parks in North Bay District, to detect the presence of larval activity; however, neither defoliation nor larvae were found.

In 1987, 414 adults were captured in comparison with 156 in 1986 (Table 17). The most noticeable increase in adult activity occurred at Killarney Provincial Park, Sudbury District where 210 adults were caught in comparison with 16 in 1986. High numbers of moths were also trapped in the South Bay Mouth area of Manitoulin Island, Espanola District.

Surveys will continue in the spring of 1988, especially in areas in which high counts were obtained. These areas will be checked carefully for larval activity and defoliation.

NORTHEASTERN REGION

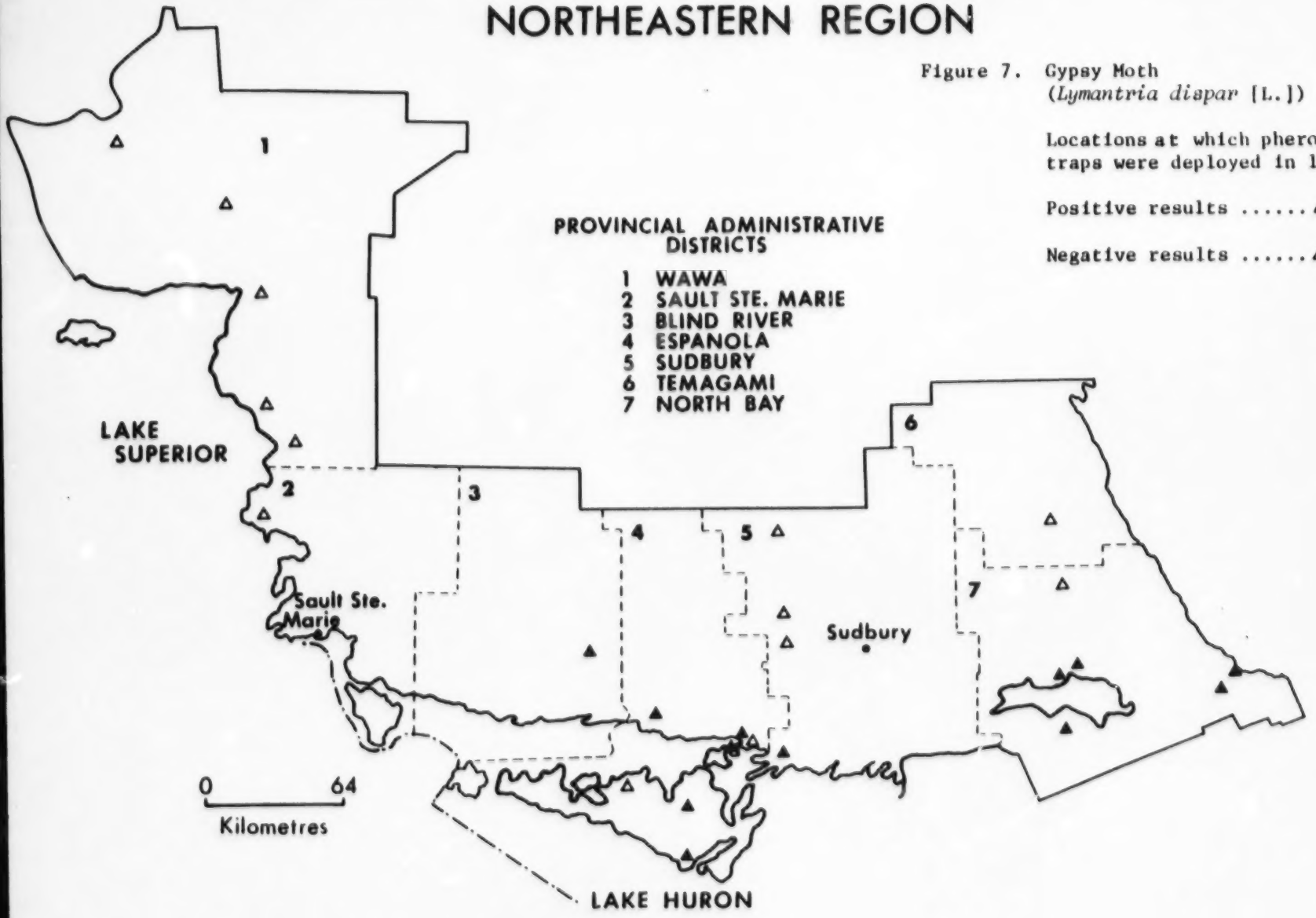


Figure 7. Gypsy Moth
(*Lymantria dispar* [L.])

Locations at which pheromone traps were deployed in 1987

Positive results ..... ▲

Negative results ..... △

Table 17. Gypsy moth pheromone trap locations, number of captures, and years in which male moths were captured in the Northeastern Region. (Two traps were deployed at each location except where otherwise indicated.)

Location	No. of male moths captured							
	1980	1981	1982	1983	1984	1985	1986	1987
Wawa District								
White Lake Provincial Park	0	0	1	0	0	0	0	0
Obatanga Provincial Park	0	1	0	0	0	0	0	0
Rabbit Blanket Lake Campground	1	0	0	0	0	0	0	0
Agawa Bay Campground	0	0	0	0	0	1	0[a]	0
Crescent Lake Campground	0	0	0	0	0	0	0	0
Sault Ste. Marie District								
Pancake Bay Provincial Park	0	0	0	0	0	0	0	0
Blind River District								
Mississagi Provincial Park	0	0	0	0	0	2	1[a]	1[a]
Espanola District								
Chutes Provincial Park	0	0	0	0	0	0	5	2[a]
Gore Bay, Gordona Lodge			0	0	0	0	0	0
Bidwell, Red Lodge			0	0	1	3[a]	2[a]	4[a]
South Bay Mouth, Trailer Park					0	1	25[a]	28[a]
Dock							0	60
Memorial Park								54
Birch Island								2
Willisville								0
Whitefish Falls								1
Sudbury District								
Halfway Lake Provincial Park	0	0	0	0	0	0	0	0
Windy Lake Provincial Park	0	1	0	0	0	0	1	0[a]
Fairbanks Provincial Park	0	0	0	0	1	0[a]	7	0[a]
Killarney Provincial Park	0	0	0	0	0	0	16	210[a]
North Bay District								
Antoine Provincial Park	0	0	0	0	0	1	54[a]	20[a]
Martin River Provincial Park	0	0	0	0	0	0	1	0[a]
Restoule Provincial Park	0	0	0	0	0	0	27	12[a]
Samuel de Champlain Provincial Park	0	0	0	0	0	1	22	17[a]
Beaucage Park								1
Beaucage Lookout								2
Temagami District								
Finlayson Point Provincial Park	0	0	0	0	0	0	0	0

[a]10 traps deployed at these locations

White Spruce Plantation Survey

Special surveys have been conducted in plantations or natural stands of various species across the region for the past several years. The species to be surveyed is visited twice during the growing season so that a picture of the insect or disease organisms that are present on the host trees throughout the active period of growth can be obtained. Included in the surveys were 12 plantations with trees in the < 2.0 m, 2.1-6.0 m and >6.0 m height categories. Two stands were selected from each category.

White spruce was the species to be examined in 1987 from 8 to 27 June and from 13 to 24 July (Fig. 8). This species has now been the subject of three surveys--in 1981, 1984 and 1987. A comparison of the results of the three surveys is made in Table 18.

Of the insects encountered, spruce budworm continues to be the most common; however, defoliation by this insect has decreased from an average of 13.6% in 1981 to 1% in 1987. Infection by the spruce needle rust is more sporadic, with defoliation averaging 7.5% in 1981, 1.3% in 1984 and 6.6% in 1987.

The erratic nature of frost damage is well documented in the surveys: the average percentage of trees affected ranged from 92 in 1981 through 63 in 1984 to 27 in 1987. It should be noted, however, that average defoliation ranged from 2 to 3%.

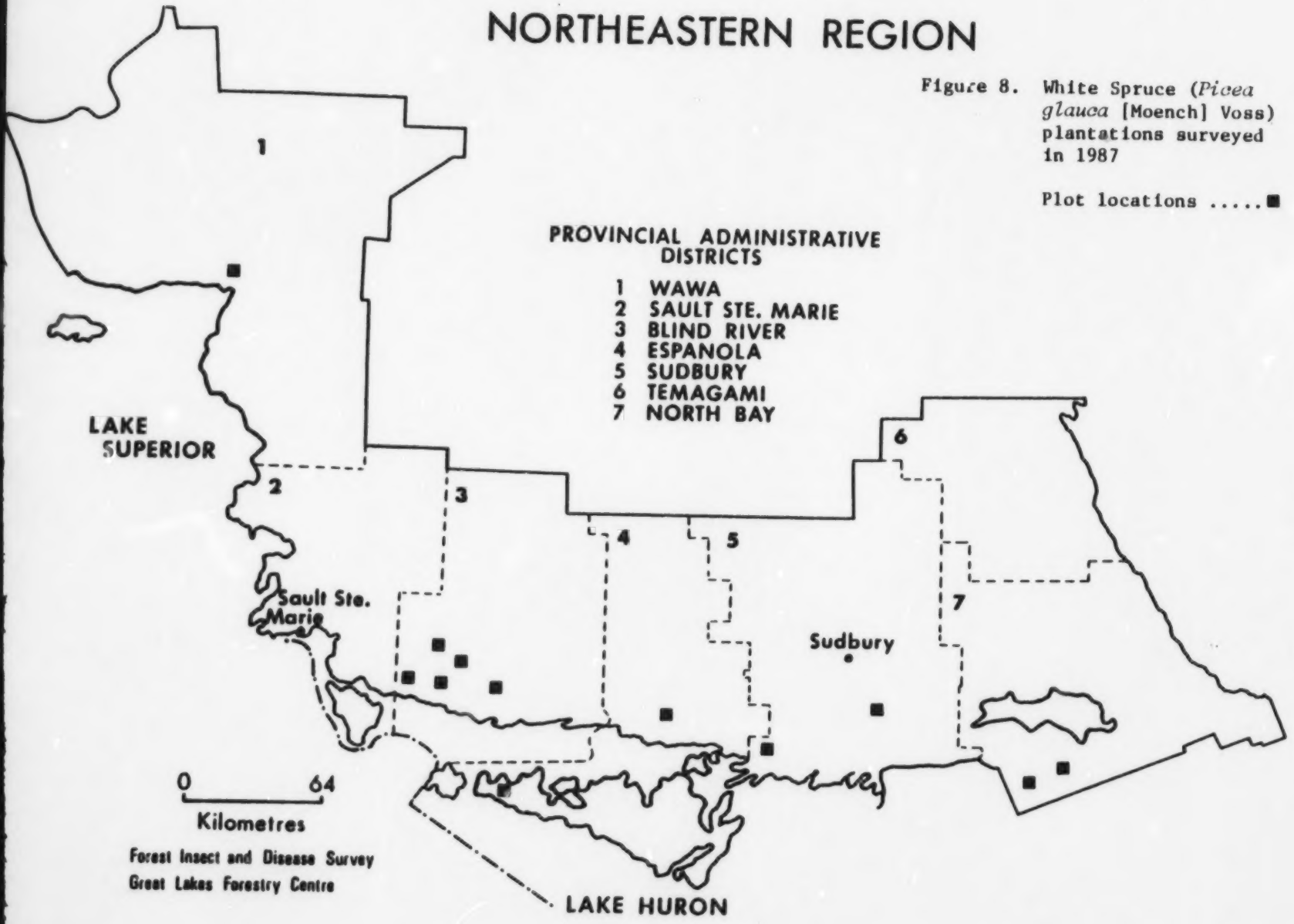


Figure 8. White Spruce (*Picea glauca* [Moench] Voss) plantations surveyed in 1987

Plot locations .....■

Table 18. A comparison of insect and disease activity recorded in white spruce surveys in the Northeastern Region (12 plantations examined each year).

Organism (Year)	Plots affected (%)	Trees affected (Avg %)	Defoliation (Avg %)
Spruce budworm			
1981	91.7	71.1	13.6
1984	75.0	41.4	5.6
1987	41.7	0.9	1.0
Spruce bud moth			
1981	50.0	23.5	not recorded
1984	16.7	1.0	not recorded
1987	66.7	31.8	not recorded
Yellowheaded spruce sawfly			
1981	25.0	7.9	2.4
1984	33.3	7.7	2.5
1987	75.0	8.3	4.0
White pine weevil			
1981	8.3	1.3[a]	N/A
1984	8.3	1.0[a]	N/A
1987	25.0	0.8[a]	N/A
Needle rust			
1981	16.7	100.0	7.5
1984	25.0	25.3	1.3
1987	50.0	27.3	6.6
Frost Damage			
1981	16.7	92.0	3.0
1984	41.7	62.8	2.4
1987	41.7	27.3	1.3

[a] Only trees with leader damage were recorded.

White Spruce Cone Survey

A special survey was carried out in 1987 to determine the impact of insect and disease populations on white spruce cones. A sample of 100 mature cones was submitted from each work area in late August and forwarded to the laboratory in Sault Ste. Marie for assessment.

The sparse cone crop on white spruce across the region made it impossible to obtain more than a single sample for examination this past summer.

In the sample submitted from Fenwick Township, Sault Ste. Marie District, 66% of the cones had been damaged by the spruce cone maggot (*Lasiomma anthracinum* [Czerny]). Feeding in conjunction with this insect were four additional lepidopterous larvae that accounted for damage to 5% of the cones examined.

Comparison of the mean seed count between the 66 damaged and 34 undamaged cones showed a seed loss of 68% in the damaged cones examined. No appreciable damage was attributed to disease organisms on the cones examined in this sample.

Maple Dieback

Twenty maple plots were established in the region in 1987 (Fig. 9) to determine the incidence of crown dieback in sugar maple and red maple. Each plot consisted of 25 mature or overmature trees selected along a 3-m-wide strip and located along a random azimuth and starting point. All trees were permanently numbered; height and diameter were measured and dieback classes were recorded. Insect, disease and animal problems, as well as abiotic conditions such as frost, were noted.

The most commonly encountered insect was the Bruce spanworm, which was found causing 5-69% defoliation in 45% of the plots. The forest tent caterpillar was observed causing 5-35% defoliation in 20% of the plots. Canker and stem decays were observed in 95% of the plots examined. Results of current dieback classifications are summarized in Table 19.

In 1988, these plots will be reexamined for all of the above problems and an additional 20 plots will be established in the region.

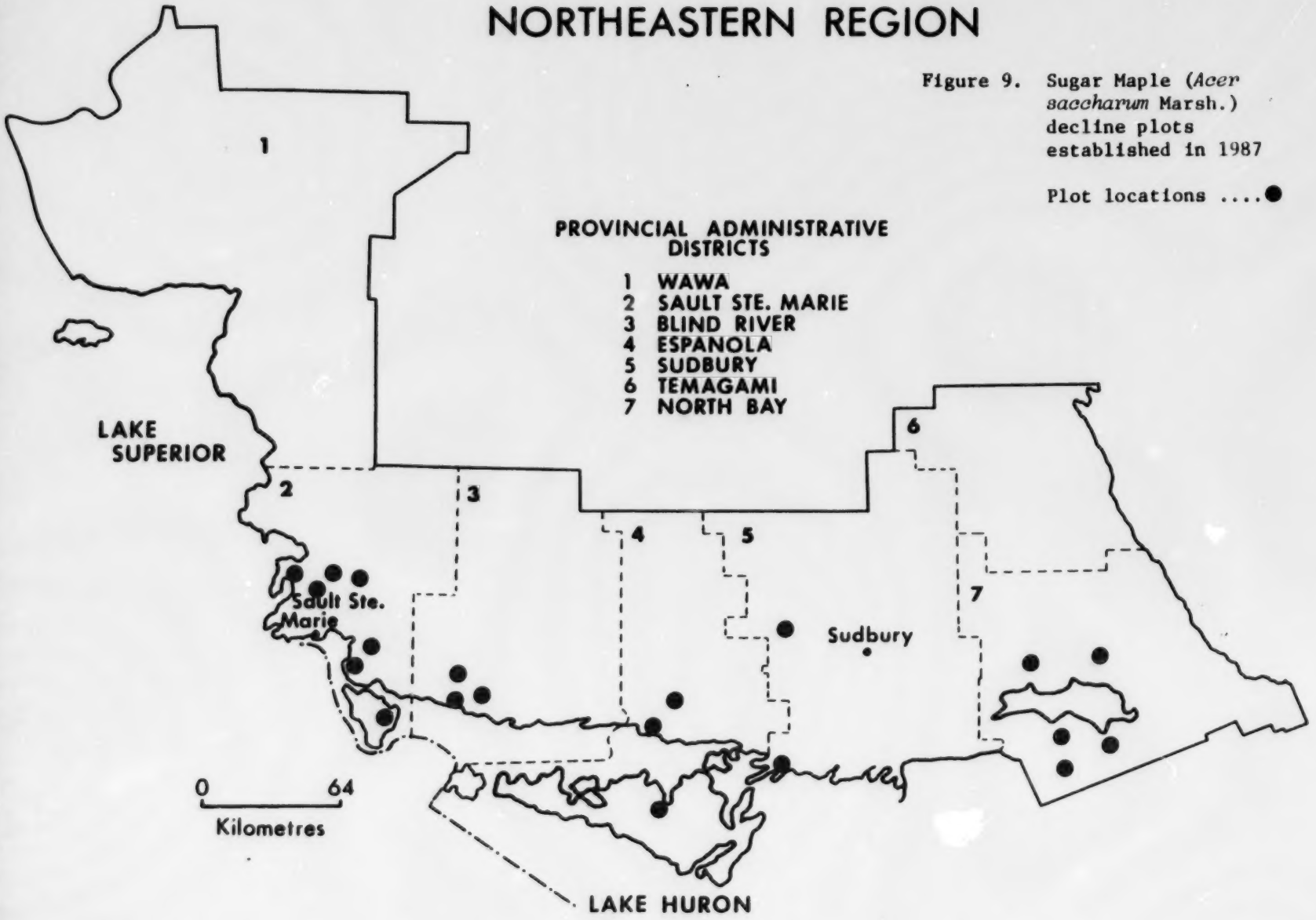


Figure 9. Sugar Maple (*Acer saccharum* Marsh.) decline plots established in 1987

Plot locations ....●

Table 19. Results of the examination of sugar maple plots in five districts in 1987 (data based on the examination of 25 host trees at each site).

Location (Twp)	Current crown dieback class[a] 0	1	2	3	4	5	Average defoliation (%)	Trees with cankers and stem decay (%)
Sault Ste. Marie								
Aweres	72	28	0	0	0	0	58	72
Deroche	80	20	0	0	0	0	69	100
Fenwick	84	16	0	0	0	0	48	0
Hilton	72	28	0	0	0	0	28	44
Hodgins	72	0	12	16	0	0	49	96
Laird	96	4	0	0	0	0	5	4
Meredith	52	0	20	16	0	12	57	12
Blind River District								
Gladstone	100	0	0	0	0	0	0	24
Thessalon	100	0	0	0	0	0	5	12
Wells	96	0	0	4	0	0	31	44
Espanola District								
Billings	100	0	0	0	0	0	25	12
Gough	96	4	0	0	0	0	0	36
Pringle	84	16	0	0	0	0	34	16
Spanish River I.R. #5	100	0	0	0	0	0	0	12
Sudbury District								
Cascaden	100	0	0	0	0	0	0	4
Rutherford	96	4	0	0	0	0	0	32
North Bay District								
Blyth	86	16	0	0	0	0	35	24
French	88	12	0	0	0	0	12	24
Nipissing	100	0	0	0	0	0	0	24
Patterson	100	0	0	0	0	0	0	16

[a] Dieback classification 0 = 0-5%, 1 = 6-20%, 2 = 21-40%, 3 = 41-60%, 4 = >61%, 5 = dead trees.

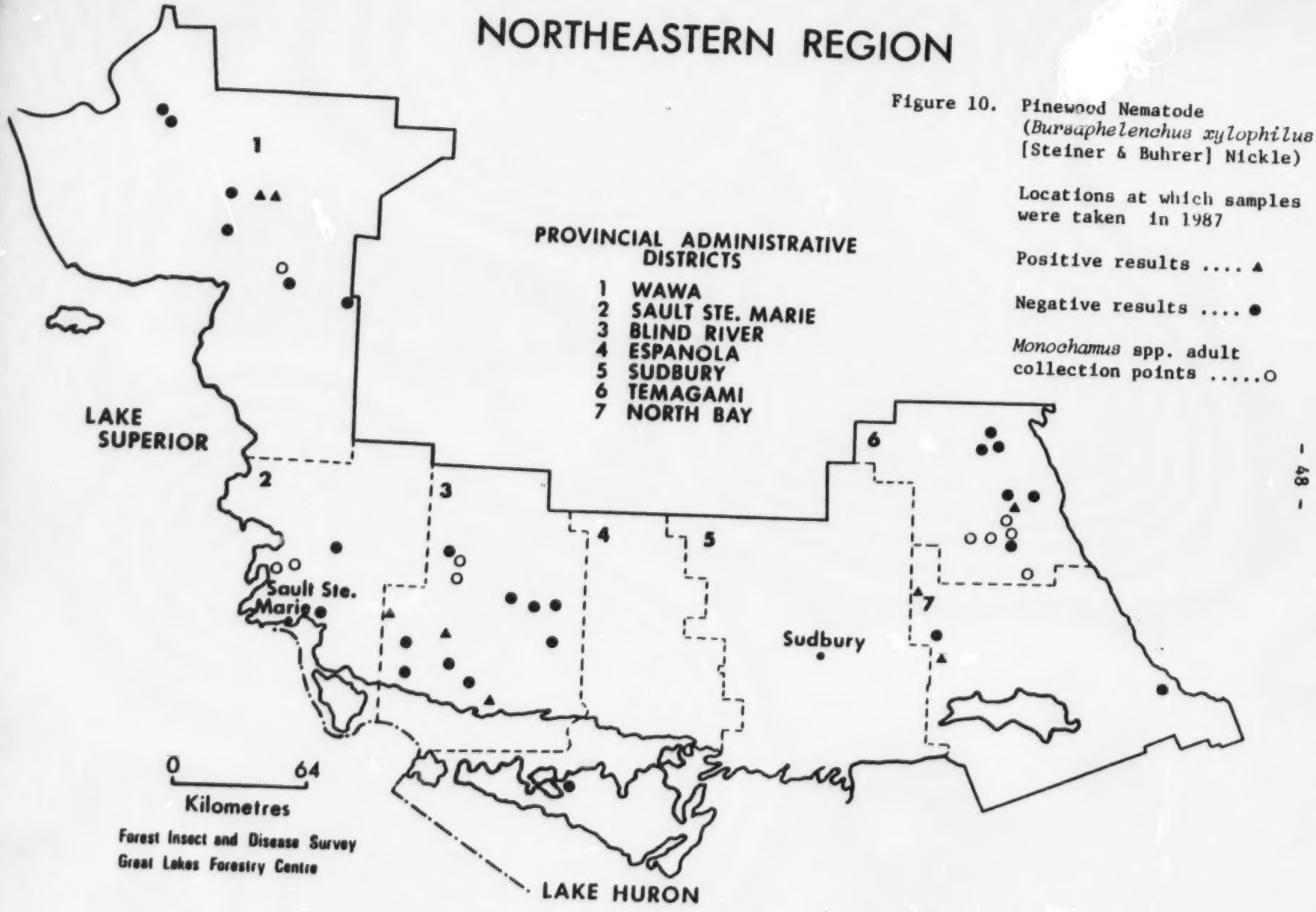


Figure 10. Pinewood Nematode (*Bursaphelenchus xylophilus* [Steiner & Buhrer] Nickle)

Locations at which samples were taken in 1987

Positive results .... ▲

Negative results .... ●

Monochamus spp. adult collection points .....○

Pinewood Nematode, *Bursaphelenchus xylophilus* (Steiner & Buhrer) Nickle

In a continuing effort to detect the pinewood nematode, 34 samples were obtained from recently dead and dying chlorotic trees across the region (Fig. 10). These trees were sampled by removing three discs from specific areas of each stem. In addition, 10 samples of sawyer beetle adults were collected in an effort to detect the presence of the pinewood nematode, since the beetles are believed to be the vector of these nematodes (Table 20).

Table 20. Locations sampled for the presence of pinewood nematode in the Northeastern Region.

Location	Tree species[a]	Final identification
Wawa District		
Cecile Twp	bF	negative[b]
Dambrossio Twp	bS	negative
Dunphy Twp	bF	positive[c]
Dunphy Twp	bS	positive
Hunt Twp	jP	negative
Maness Twp	bF	negative
Maness Twp[d]	jP	not confirmed
Menzies Twp	bS	negative
Recollet Twp	jP	negative
Sault Ste. Marie District		
Fenwick Twp[d]	no host	not confirmed
Garden River Indian Reserve	aP	negative
Gaudette Twp	wS	negative
Van Koughnet Twp[d]	jP	not confirmed
Blind River District		
Bouck Twp	bF	negative
Cobden Twp	bF	positive
Grasett Twp	bF	positive
Haughton Twp	bF	negative
Kirkwood Twp	wS	negative
Morin Twp	bF	positive
Parkinson Twp	jP	negative
Patton Twp	tL	negative
Poulin Twp	bF	negative
Rioux Twp[d]	wS	not confirmed
Sagard Twp	jP	negative
Viel Twp	bF	negative
Villeneuve Twp	bF	negative
Villeneuve Twp[d]	wS	not confirmed

(cont'd)

Table 20. Locations sampled for the presence of pinewood nematode in the Northeastern Region (concl.).

Location	Tree species[a]	Final identification
Espanola District		
Gordon Twp	bF	negative
North Bay District		
Crerar Twp	bF	negative
Hugel Twp	bF	positive
Mattawan Twp	jP	negative
McNish Twp	jP	positive
Temagami District		
Barr	jP	negative
	jP	negative
	jP	negative
Best	wS	negative
	bF	negative
	jP	positive
Briggs[d]	jP	not confirmed
Joan[d]	rP	not confirmed
Milne[d]	jP	not confirmed
Strathcona[d]	wP	not confirmed
Strathcona[d]	bF	negative
Strathy[d]	jP	not confirmed

[a] bF = balsam fir, bS = black spruce, jP = jack pine, aP = Austrian pine, wS = white spruce, tL = tamarack, rP = red pine, wP = white pine

[b] negative - no nematodes present

[c] positive - nematodes present

[d] Adult *Monochamus* beetles were the source of the collection. (Nematodes were not identified.)

Acid Rain National Early Warning System (ARNEWS)

ARNEWS study plots were established in 1984 and 1985 in Wawa, Sault Ste. Marie, Sudbury and North Bay districts. There were no visible signs of damage by acid precipitation in the four study areas this year.

The plots were visited twice during the summer for the purpose of monitoring various insect and disease problems and aerial photographs were once again taken to detect any abnormal color changes. Soil samples were collected from all areas for the first time since the plots were established and were submitted to the Great Lakes Forestry Centre for chemical analysis.

The Bruce spanworm was present in a sample plot in Wishart Township, Sault Ste. Marie District, where it accounted for approximately 10% defoliation, and 20% defoliation by the forest tent caterpillar was recorded in Calvin Township, North Bay District.

The only disease encountered was a trace level of a leaf anthracnose (*Discula campestris* [Pass.] v. Arx.) on sugar maple in Wishart Township, Sault Ste. Marie District.

Climatic Data

Environmental factors such as temperature and precipitation play an important role in the development of insects and diseases and in tree growth in the forest. Certain weather conditions can predispose the forest to damage, and can be the cause of marked fluctuations in insect populations or in the incidence of disease. Adverse weather conditions cause abiotic damage such as frost, winter drying or scorch, breakage due to wind, snow or hail damage and drought. Weather data for three locations across the region are recorded in Table 21. This table includes the monthly mean temperature, total precipitation and 1987 deviation from the normals.

More detailed weather information can be obtained from local Atmospheric Environment Service weather offices.

Table 21. Mean temperature, total precipitation and deviation from the norm for 1987 at three locations across the Northeastern Region.

Location	Month	Mean temperature (°C)		Deviation from norm (°C)	Total precipitation (mm)		Deviation from norm (%)
		Normal	Actual		Normal	Actual	
Sault Ste. Marie Airport	January	-10.1	-7.0	+3.1	74.0	56.6	-23.5
	February	-10.0	-6.4	+3.6	68.0	15.6	-77.1
	March	- 5.1	-1.9	+3.2	60.4	35.3	-41.6
	April	3.1	6.9	+3.8	64.4	36.8	-42.9
	May	9.1	11.1	+2.0	84.2	81.2	- 3.6
	June	14.6	15.9	+1.3	74.2	62.6	-15.6
	July	17.3	19.4	+2.1	55.6	94.8	+70.5
	August	16.9	17.5	+0.6	82.7	117.4	+42.0
	September	12.8	14.1	+1.3	95.3	76.6	-19.4
	October	7.6	5.6	-2.0	74.2	127.4	+72.0
	November	0.7	1.2	+0.5	93.3	105.6	+13.2
	December	- 6.7	-3.2	+3.5	79.6	84.6	- 6.3
Sudbury Airport	January	-13.7	-9.9	+3.8	57.5	30.9	-46.3
	February	-12.5	-9.6	+2.9	47.0	44.6	- 5.1
	March	- 6.0	-2.7	+3.3	55.2	46.2	-16.3
	April	2.7	7.5	+4.8	61.1	46.8	-23.4
	May	10.5	11.5	+1.0	67.1	70.0	- 4.3
	June	16.0	17.4	+1.4	82.8	58.2	-29.7
	July	18.7	20.3	+1.6	83.1	45.4	-45.4
	August	17.3	17.7	+0.4	82.9	43.7	-47.3
	September	12.2	13.8	+1.6	106.5	93.8	-11.9
	October	6.3	4.4	-1.9	74.6	70.7	- 5.2
	November	- 1.2	-1.2	0.0	77.8	80.3	+ 3.2
	December	-10.2	-5.8	+4.4	65.8	73.5	+11.7
North Bay Airport	January	-13.0	-10.0	+3.0	63.5	29.1	-54.2
	February	-11.3	-10.4	+0.9	56.2	41.6	-26.0
	March	- 5.3	- 2.2	+3.1	61.1	71.9	+16.7
	April	3.2	7.5	+4.3	62.3	48.6	-22.0
	May	10.6	11.1	+0.5	69.3	78.9	+13.8
	June	15.7	16.8	+1.1	85.1	117.6	+38.2
	July	18.3	19.8	+1.5	102.4	73.0	-28.7
	August	17.0	16.7	-0.3	98.7	126.6	+28.3
	September	12.2	13.5	+1.3	115.9	58.8	-49.3
	October	6.4	4.1	-2.3	87.7	99.8	+13.8
	November	- 1.0	- 1.1	-0.1	86.6	59.2	-31.6
	December	- 9.7	- 6.0	+3.7	75.4	86.4	+14.9